DOCUMENT RESUME

ED 275 558 SE 047 565

AUTHOR Friedland, Mary
TITLE Earth Resources. Earth Science in Action. Teacher's Manual and Workbook.
REPORT NO ISBN-0-88102-025-7
PUB DATE 84
NOTE 55p.
AVAILABLE FROM Janus Book Publishers, Inc., 2501 Industrial Parkway West, Hayward, CA 94545 ($2.85).
PUB TYPE Guides - Classroom Use - Materials (For Learner) (051) -- Guides - Classroom Use - Guides (For Teachers) (052) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Air Pollution; Conservation (Environment); *Earth Science; Elementary Education; *Elementary School Science; Environmental Education; Fuel Consumption; Minerals; *Natural Resources; *Science Activities; Science and Society; Science Education; *Science Instruction; *Special Education; Water Resources
IDENTIFIERS Special Needs Students

ABSTRACT

The Science in Action series is designed to teach practical science concepts to special-needs students. It is intended to develop students' problem-solving skills by teaching them to observe, record, analyze, conclude, and predict. This document contains a student workbook which deals with fundamental concepts about natural resources. Six separate units include: (1) air; (2) water; (3) living off the land; (4) fossil fuels; (5) minerals; and (6) save your resources. The units consist of basic introductory information and questions, worksheets, a self-checking quiz, and instructions for experiments. A cumulative test is provided at the end of the workbook, along with a glossary. The teachers guide (which is included) explains how to use the workbook, together with teaching suggestions and enrichment activities for each unit. (TW)

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Earth Resources

Earth Science in Action

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Earth Resources

Earth Science in Action

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International Standard Book Number 0-88102-025-7

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Printed in the United States of America. 7 8 9 0 0 9 8 7 6 5 4 3

Teacher's Manual

Earth Resources

Mary Friedland

A Janus Earth Science in Action Book

Teacher's Manual written by Mary Friedland

OVERVIEW

Making Science Real

We developed ***Earth Resources*** for the older adolescent with reading and learning problems. A Janus ***Science in Action*** workbook, *Earth Resources* teaches slow learners some fundamental facts about natural resources.

Earth Resources encourages students at all levels to continue learning. Enrichment activities are offered in every unit, at progressive levels of difficulty. Some activities interest the needier students; others challenge the more capable ones.

Designed for Success

Special-needs students can find it difficult to grasp scientific concepts. *Earth Resources* is written to help the student understand difficult ideas. Each lesson presents one major concept broken down into manageable steps and explained in simple language. The learning is reinforced through activities and experiments designed for concrete learners.

Earth Resources is one of a set of ***Earth Science in Action*** workbooks. (The other Janus sets are ***Physical Science in Action*** and ***Life Science in Action***.) Like all Janus science books, *Earth Resources* can be used as the core of or supplement to your science program.

OBJECTIVES OF THE WORKBOOK

The Janus *Science in Action* series is designed to help special-needs students learn basic and practical science concepts that can be applied to daily living. It also helps students develop problem-solving and thinking skills by teaching them to observe, record, analyze, conclude, and predict.

Objectives of *Earth Resources* are to help students:

- learn that Earth has these resources: air, water, plants and land, fuel, and minerals;
- learn where we find those resources;
- learn the major uses we make of resources;
- learn some major problems associated with our use of resources;
- investigate the use, control, and conservation of resources in their community;
- learn a vocabulary for discussing resources and their uses.

READABILITY

The average reading level of *Earth Resources* is below 2.5, according to the revised Spache Readability Formula. Science words that help students understand and discuss the concepts are defined in a glossary at the end of the book. Those words are also set in boldface type the first time they appear in the text.

We suggest that you review these difficult words frequently. Teach the words through daily exercises and word games. Encourage students to use the words in discussions and assignments for other classes.

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HOW TO USE *EARTH RESOURCES*

The Workbook Format

Earth Resources is formatted so students can recognize what to do on each page. Units 1 to 5 begin with an introduction and short vocabulary exercise. Lessons are short—one to two pages—so students can finish in a reasonable amount of time. Activities reinforce and expand the concepts that lessons teach.

Units end with a page of wrap-up exercises: "Earth Watch" asks students to investigate local uses of resources; "Check Yourself" tests comprehension of major concepts; and "Check These Out" suggests enrichment activities at a broad range of skills levels.

Unit 6 motivates students to explore the problems and solutions to natural resource use in their own community.

Introducing the Book

Ask students to name some materials that keep them alive. Then ask how they get those materials. Lead students to conclude that everything they need or use comes from Earth. Then, tell them that this book explains how we get and use those materials.

Pass out the books and let students leaf through them. Comment on the attractive illustrations. Finally, have a student read the introduction out loud. You might say: *What resources are you using right now? You'll learn about one on the next page.*

Introducing a Unit

Ask students to look at the picture on the first page of the unit. Have them identify that unit's resource and try to explain why it is important. Then have a student read the unit introduction.

Write the "Before You Start" words on the chalkboard. Pronounce them, and have students complete the exercise. Discuss the words until students start to feel comfortable with them.

Some Teaching Suggestions

Structure Science Classes

We strongly recommend you keep the class together for these lessons. That allows you to lead discussions and give demonstrations. Students will benefit from your guidance and the insights and opinions of others.

At the start of a lesson, introduce unfamiliar words. Review concepts students have already learned, then focus students on the day's lesson by asking questions or mentioning current events related to that topic. After a lesson, spend a few minutes reviewing what the students learned.

Guide your class through the activities. Make sure all students have the proper materials and that they understand how to use them. (Have extra materials on hand, in case some are broken or lost.) Demonstrate any difficult procedures. Allow all students to correctly complete one step before you proceed to the next. Pair the slower students with more capable "lab partners."

Be Prepared!

Always read the lessons and try out the activities in advance. You may have to make minor adjustments in materials or procedures.

Gather together all the materials you'll need before the start of class. Keep reference books in the classroom. Have magazines and activities on hand for those students who finish assignments quickly. ("Check These Out" on the last page of each unit suggests independent activities.)

End-of-the-Book Exercises

A test page at the end of the book checks the student's understanding of the major concepts and vocabulary. Included is a certificate of congratulations to the student for mastering the material. Both the mastery test and the certificate can be used to reinforce the student's sense of accomplishment.

About the Glossary

Words that appear in boldface type are listed and defined in a glossary at the end of the workbook.

The words are divided into syllables to help students decode. Definitions are deliberately narrow to pertain only to those science concepts taught in *Earth Resources*.

TEACHING THE UNITS

Unit 1: Air

Target Words: *atmosphere, carbon dioxide, oxygen, particle, pollution, smog, vital, water vapor*

This unit explains the importance of Earth's atmosphere and describes some ways that air becomes polluted. (For more information and activities on atmosphere, you can consult *Weather*, another Janus *Science in Action* book.)

PAGE 5: **All Around Earth**

Our atmosphere provides vital gases (particularly oxygen and carbon dioxide) and moves weather systems around Earth. Weather is also created because we have an atmosphere. Air moves clouds, which distribute water to plants and animals all around Earth.

PAGES 6–7: **Experiment 1—Why does a fire need oxygen?**

Materials: *votive candles, saucers, matches, small glass jars*

This experiment demonstrates that fire needs the oxygen in air. Caution your students to practice safety with their fire. If this is your students' first science experiment, explain that an experiment is a test that answers a question. The student must observe what happens during the test and draw conclusions based on those observations.

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Observations: 1. The candle in the jar goes out. **2.** The candle not in the jar keeps burning.

Conclusions: 1. a. The candle inside the jar went out because it ran out of oxygen; **b.** The other candle stayed lit because it had oxygen. **2.** The flame almost went out but then it came back. **3.** If we couldn't make fires we couldn't cook, stay warm, or manufacture things.

PAGE 8: **Air Protects Earth**

Students learn that the atmosphere provides another vital function: It protects Earth from extreme temperatures and objects hurtling through space. Ask students why objects burn in our atmosphere (because it contains oxygen). Point out that the atmosphere also absorbs radiation and ultraviolet rays. If Earth didn't have an atmosphere, its surface would be like that of the moon: pitted with holes.

PAGE 9: **Dirty Air**

This page discusses the harmful effects of smog. Smog harms people. It also makes plants wither and buildings erode. When smog is particularly bad, people should avoid being outdoors or doing strenuous work. You might want to tie in the harmful effects of cigarette smoke, another form of air pollution.

PAGE 10: **Earth Watch**

An "Earth Watch" activity appears at the end of each unit. In those activities, students will create a scrapbook about resources in their community. Students each need a notebook. Have them label it *Earth Watch* and prepare a "Contents" page. They can use dividers to separate their entries on the various resources.

In this "Earth Watch," students investigate air quality control. Encourage students to collect related news articles for their notebooks.

PAGE 10: **Check Yourself**

1. a. It keeps Earth warm enough for living things; **b.** It gives living things the gases they need to stay alive; **d.** It carries water to living things. **2.** (Wording will vary.) Smoke from factories and cars makes air pollution.

Enrichment Activities

- Have a janitor explain to your class how indoor air is filtered.
- Get Mariner space probe photographs of the atmospheres of other planets. Which ones might be able to support life?
- Show a film on how weather systems form and change.

Unit 2: Water

Target Words: *dam, evaporate, ground water, renewable resource, reservoir, source*

Students learn that water circulates throughout Earth. They also learn how we treat and transport the water we use. (For more information and activities on water, see Janus workbook *Weather.*)

PAGE 12: **Water Everywhere**

This page explains that water resources are both vital and renewable. Emphasize that Earth's huge water supply is misleading: Ocean water is too salty to use directly, and many parts of Earth have chronic water shortages. Water can become polluted and then harm people, plants, and animals that use it. Students will list some ways they use water (drinking, bathing, putting out fires, etc.). You can divide the class into teams for this exercise, and let each team try to come up with the most uses.

PAGE 13: **Oceans in Motion**

Students learn the water cycle: Water evaporates from Earth's surface, forms clouds, moves, falls to Earth, and flows to bodies of water. **1.** evaporates; water vapor **2.** clouds **3.** Rain, ice, or snow

PAGE 14: **Our Sources of Water**

Communities draw water from lakes, rivers, and underground sources and store water in tanks or reservoirs. They use the stored water at times such as heat waves when people need extra water. Get a map of your state and have students locate bodies of water that residents use.

PAGE 15: **Let It Flow!**

Pictures illustrate how community water is treated and transported to a home. Ask your local water department for a map of water mains. Let students find the mains that go to their homes.

PAGES 16–17: **Why Is Water Treated?**

Materials: *pond water, microscope, glass slides, cover slips, droppers*

Students inspect pond water under a microscope. They see microscopic plants and animals and inorganic matter. Guide your students through the use of the microscope.

What Do You Think? (Wording will vary.) **1.** I see dark specks in the water. **2.** Those specks are dirt and tiny plants and animals. **3.** We treat water to kill germs and get rid of dirt.

PAGE 18: **Earth Watch**

Students find out about their community's water quality control. If possible, have your class tour the local water treatment facility.

PAGE 18: **Check Yourself**

1. (Water is a vital resource because) **c.** it keeps living things alive. **2.** (Communities get water from sources such as) **a.** wells, lakes, and rivers. **3.** (Water is treated to) **c.** make it clean and safe to use.

Enrichment Activities

- Investigate jobs in the water department.
- Describe famous water expeditions (e.g. Magellan sailing around the world, Columbus discovering America, Marquette exploring the Mississippi).

- Get some aquatic plants from a pet store and grow them in an aquarium.
- Demonstrate water filtration. Pour dirty dish water through sand or gravel.

Unit 3: Living Off the Land

Target Words: *drought, forest, nutrient, product, topsoil*

This unit describes how farm land and forest land provide vital resources and raw materials. (For information and activities on plants, consult *Green Plants*, another Janus *Science in Action* workbook.)

PAGE 20: **Food, Clothing, and a Home**

This page describes important products we make from plants and animals. Then students think of additional products on their own (for example: ropes, newspapers, and pencils from plants; fur coats, down jackets, and wool sweaters from animals). You may want to bring in a book that shows plant and animal products.

PAGE 21: **The Things You Use**

Students identify specific items they use (such as foods and articles of clothing) that are made from plant or animal materials. They also identify the raw material of each item as "plant" or "animal." Have students discuss their answers, then make a poster of those products.

PAGE 22: **Forest Land**

Forests are important to life. They provide homes for animals, and their plants produce oxygen and water vapor. To illustrate the role of plants, draw simple diagrams on the chalkboard showing the *oxygen cycle* (carbon dioxide in air, into plants, changed to oxygen, back to air) and extending the *water cycle* (discussed in the last unit) to include plants. At the end of the page, students say what might happen if too many forests are cut down. (We won't have enough oxygen and water, which are put in air by green plants.)

PAGE 23: **Farm Land**

Students find out that crops grow in the topsoil of farmland. Discuss methods of maintaining topsoil, such as fertilizing, contour plowing, and irrigation. Farm lands can have problems of not enough nutrients and too many harmful chemicals.

PAGE 24: **Acid Rain**

This danger to our crops happens when chemicals mix with rainwater to form acids such as sulfuric acid. The chemicals, byproducts of burning fossil fuels, travel through the air from industrial areas. Students use vinegar in this experiment for safety reasons. (The results are the same as for other acids.) You may wish to use dilute sulfuric acid if you can carefully monitor your students during the experiment.

PAGES 24–25: **Experiment 2—What does too much acid do to plants?**

Materials: *radish seeds, Styrofoam coffee cups, potting soil, vinegar, water, tablespoon, pencil*

Students add vinegar to planted radish seeds. They discover that acid inhibits plant growth.

Have students plant the seeds about ¼-inch deep, and always keep the soil moist. When the experiment is over, students can grow radishes with their control plants. This experiment takes three or four days.

Observations (wording will vary): **1.** Nothing happened in the cup that got acid. **2.** Seeds sprouted in the cup that didn't get acid.

Conclusion (wording will vary): Acid stops plants from growing.

PAGE 26: **Earth Watch**

Students investigate agricultural practices in their community. You may want to end this lesson with a lunch or snack of locally grown food products. (Some fruits or vegetables, eggs, or dairy products are available in most communities year-round.)

PAGE 26: **Check Yourself**

(Wording will vary.) **1.** We use plants for food, clothing, houses, wood products, paper products, and medicine. **2.** We use animals for food, clothing, and pillows. **3.** Forests are homes for animals, and they produce oxygen and water vapor. **4.** Farm lands supply crops and livestock. **5.** Acid rain pollutes topsoil.

Enrichment Activities

- Take your class to a greenhouse or nursery. Find out how plants are used in horticulture.
- Have students grow cherry tomatoes in pots.
- Take your class to a pet store. Find out which animals make good house pets and how to care for them.
- Invite someone from the city planner's office to tell your class what construction projects are planned for land in your town.

Unit 4: Fossil Fuels

Target Words: *conserve, fossil, non-renewable resource, properties*

Our main fuels are the fossil fuels—coal, petroleum, and natural gas. Students learn where those fuels

come from, how we use them, and how our use affects other resources. (For more information on fuel, consult *Energy* and *Electricity*, two other Janus *Science in Action* workbooks.)

PAGE 28: **Ancient Energy**

Scientists think coal was formed from the deeply buried remains of ancient plants. Over millions of years, enormous pressure and heat deep within Earth changed the remains to coal. Students state problems we have using coal (pollution, destroying land, dangers of coal mining, etc.).

PAGE 29: **Ocean Fossils**

Scientists believe petroleum and natural gas formed from the fossils of tiny ocean plants and animals. Heat and pressure within Earth caused the fossil material to change. Today we use those fuels for cooking, heating, and transportation. We also make petroleum products such as plastic, paint, and synthetic fibers. Point out how our demand for petrochemical products decreases the supply of fuel oil and raises its price.

PAGES 30–31: **Experiment 3—What are the properties of oil?**

Materials: *machine oil, water, droppers, paper towels, pencils*

Students discover that the properties of machine oil, a petroleum product, make it a good lubricant.

Observations: **1. b.** It feels slippery. **2. a.** It stays on your fingers. **3.** Oil did not evaporate.

Conclusion (wording will vary): Oil is put in machines to make metal parts move more easily.

PAGE 32: **The Trouble with Fossil Fuels**

This page discusses problems that stem from our use of fossil fuels. When readily obtainable sources are exhausted, we may have to make do with less. Students see how one problem, pollution, can endanger our food. They think of ways to alleviate that danger. (For example, control the amount of chemicals that factories can send into the air.)

PAGE 33: **What Can We Do?**

Students learn about measures that curb our fuel problems. Then they list ways to conserve fuel. Suggest that your class make a poster of fuel conservation rules for the classroom.

PAGE 34: **Earth Watch**

The class contacts a person from a utility company to find out how fossil fuels are used locally. You might ask about guest speakers, literature, and films that utility companies often provide.

PAGE 34: **Check Yourself**

1. a. petroleum; **b.** natural gas; **c.** coal

2. (answers may vary) Earth isn't making any more fossil fuels; we're using up all of Earth's fossil fuels.

Enrichment Activities

- Have your class make a display of petroleum products (oils, synthetic fabrics, plastics, paints, etc.). Each student can contribute an item.
- Show a film on alternative sources of energy.
- Take your class to a natural history museum. Find out what Earth was like in the days of the dinosaurs.
- Have students make "fossils" with plaster of Paris. Use twigs, leaves, shells, handprints, etc. for impressions.

Unit 5: Minerals

Target Words: *alloy, crystal, metal, ore, raw materials, recycle*

Earth's minerals are a varied group of resources. In this unit students find out what kinds of minerals there are and how we use them.

PAGE 36: **Raw Materials**

Minerals are usually classified as *metallic* (example: iron) and *non-metallic* (example: marble). Students learn that minerals are non-renewable resources, and they think of a problem with using minerals (limited supply, damaging Earth, etc.).

PAGE 37: **Crystals**

Materials: *salt, small dishes or plates, hot water, spoons, hand lens*

Students "grow" salt crystals. They observe the crystals with a hand lens and draw what they see. This activity take three days. (You may have difficulty getting crystals like the illustration if your area is very humid.)

PAGE 38: **Metals in Your Life**

This page describes how we extract metal ores and how we use them. Students name products made from our most common metal alloy, *steel*. Cars and tools are examples of steel products.

PAGE 39: **An Iron Factory**

This page explains how steel is made from iron. Making steel requires huge amounts of these resources: iron, fossil fuels (to heat the blast furnaces), and air and water (to keep them from overheating).

PAGE 40: **Trouble Again!**

Students read about common problems we have with minerals, and learn that recycling mineral products can alleviate the problem. Students then think of a product they use that they could recycle, such as bottles or cans.

PAGE 41: **Earth Watch**

Your class finds out how a recycling center operates. Then they collect materials to take to that center. If

there is not a recycling center close by, you can check into scavenger services.

PAGE 41: **Check Yourself**
(Answers will vary.) **1.** Some metallic minerals are iron, aluminum, copper, silver, gold, tin, etc. **2.** Some metal products are appliances, coins, wire, furniture, cars, etc. **3.** Some non-metallic minerals are diamonds, marble, gypsum, salt, quartz, etc. **4.** Some things we make with non-metallic minerals are roads, statues, jewelry, tools, etc. **5.** Some problems with minerals are damaging land, polluting other resources, running out, etc.

Enrichment Activities
- Take your class to a jewelry store to find out how gems are cut.
- Invite a representative from a local factory to tell your class about jobs in manufacturing.

Unit 6: Save Your Resources!

This final unit is a guided research project about a community resource problem. Lead your students through each step in this project.

PAGE 42: **Problems!**
On this page students review the main resources and their problems. This review prepares the student to select a research problem.

PAGE 43: **Get the Facts!**
Students compile a list of sources of information on resource problems. You may want to bring in newspapers and magazines that are particularly useful, and read through a television program guide with your students to identify useful programs. Have students think of government agencies and businesses they've contacted that may be of help.

PAGE 44: **What's the Problem?**
Students select a research problem. They investigate the problem and record their findings.

PAGE 45: **Take Action!**
Students think of ways to correct the problem they studied. You may want each student to present his or her findings to the class. Other students can offer additional information or ideas.

Enrichment Activities
- Set up a bulletin board where students can post articles that might help another student's research.
- Join an Earth Day celebration (April 22).

Show What You Learned

PAGE 46: **What's the Answer?**
1. water **2.** air **3.** plants and animals; minerals **4.** fossil fuels; minerals **5.** air; water; plants and animals **Choose one resource.** Accept all appropriate answers.

PAGE 46: **What's the Word?**
1. Atmosphere **2.** Pollution **3.** Evaporate
4. Conserve **5.** Alloy **6.** Raw Materials
7. Topsoil

TEACHING AIDS

Resources

For information and teaching materials, contact local offices of these agencies:
- National Wildlife Federation
- Sierra Club
- Environmental Protection Agency
- Utility companies
- Department of Parks and Recreation
- Science museums

As a further resource, contact:
- Lawrence Hall of Science
  University of California
  Berkeley, CA 94720

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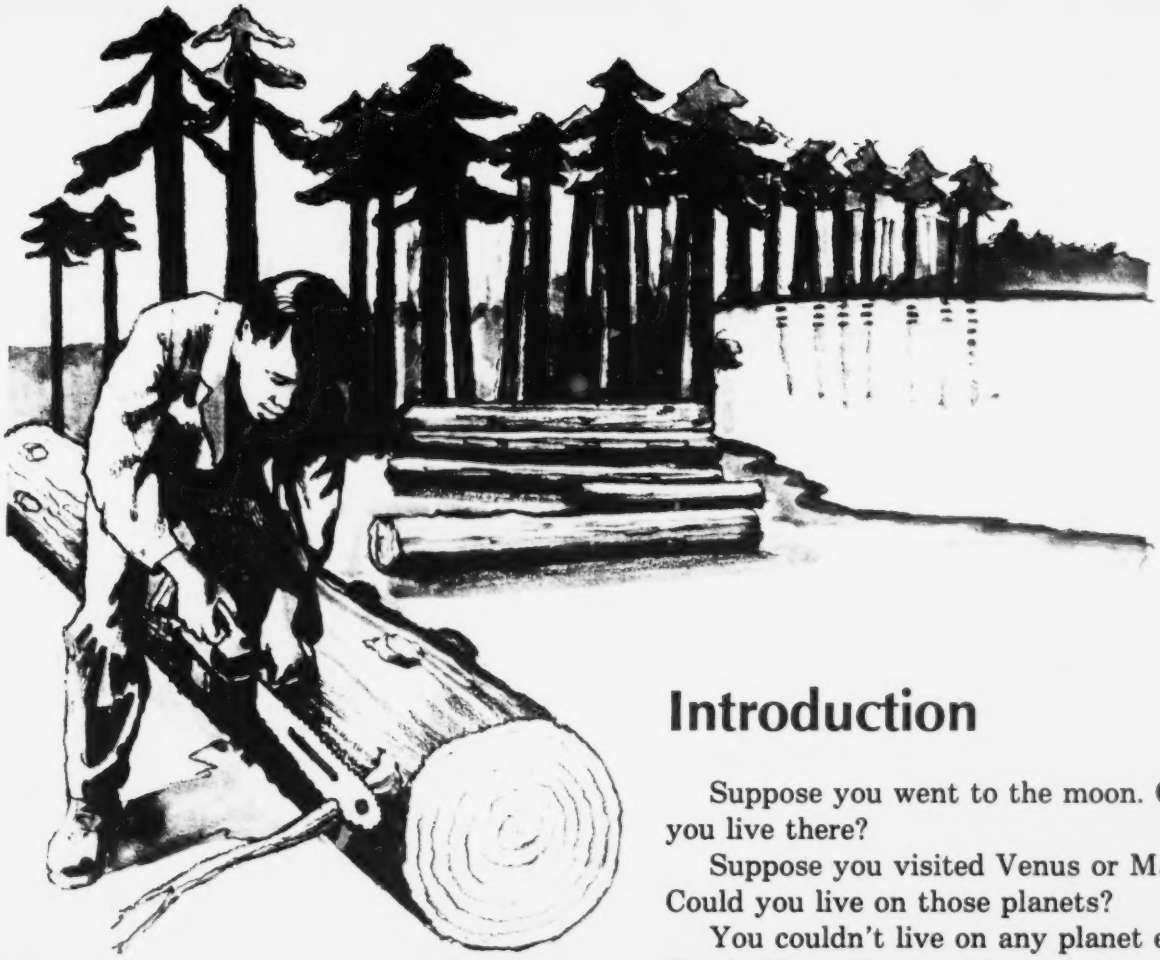


Introduction

Suppose you went to the moon. Could you live there?

Suppose you visited Venus or Mars. Could you live on those planets?

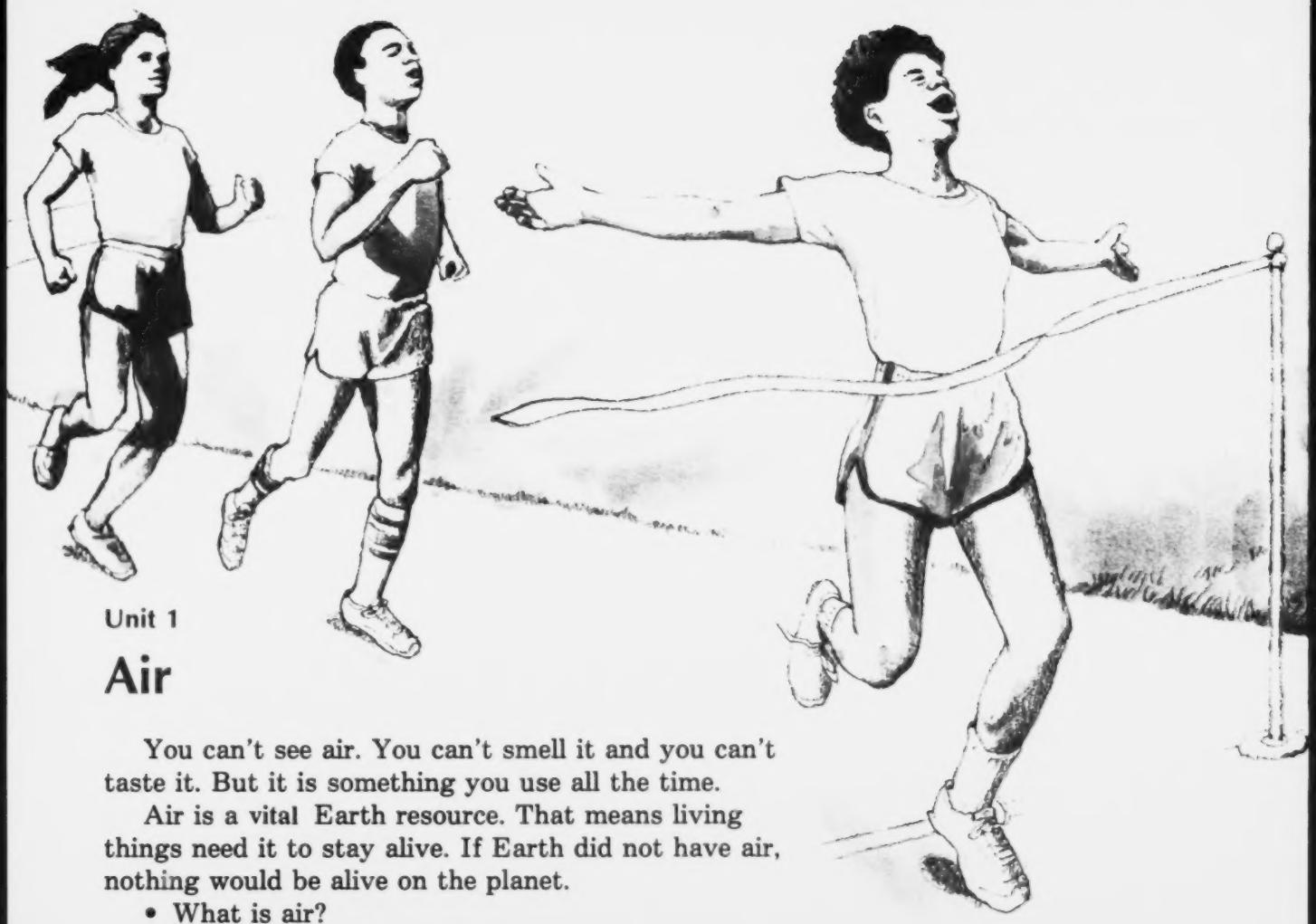
You couldn't live on any planet except Earth! Not unless you brought from Earth the materials you need to stay alive.

Earth is the only planet we know of that has life. Things can live on Earth because it has the materials that living things need in order to be alive. We call those *vital* materials *Earth resources*.

Earth is made up of other kinds of materials, too. We use those materials to make things we need such as clothes, houses, tools, medicine, and machines. The materials we use to make things with are also Earth resources.

In this book, you'll learn about some important Earth resources that we use. You'll learn how we can use those resources wisely.

Right now you're using some Earth resources. What do you think one is?



Unit 1

Air

You can't see air. You can't smell it and you can't taste it. But it is something you use all the time.

Air is a vital Earth resource. That means living things need it to stay alive. If Earth did not have air, nothing would be alive on the planet.

- What is air?
- How is air a vital resource?
- What problems do we have with air?

You'll find out in this unit.

Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary that's at the back of this book. On the lines below, write what the words mean.

1. **atmosphere** _____

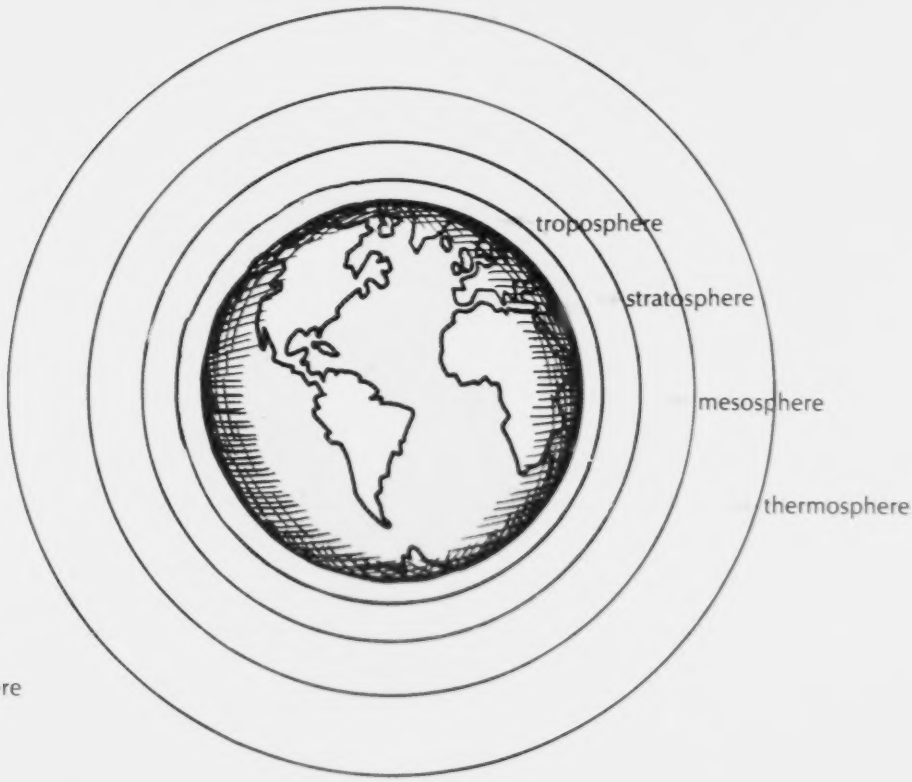
_____

2. **particle** _____

_____

3. **vital** _____

_____



All Around Earth

Our planet Earth is surrounded by gases. The gases swirl all around Earth. They cover all parts of Earth. Look at the diagram. What do we call the gases that cover Earth?

_____

We call those gases the *atmosphere*. (Another name for the atmosphere is *air*.)

Scientists divide the atmosphere into four layers. You can see the names of the layers on the diagram. Which layer is closest to Earth?

_____

Right! It's the *troposphere*.

The troposphere contains the largest amount of gases. *Nitrogen* is the main gas in the troposphere. Other gases are **oxygen, carbon dioxide,** and **water vapor**.

Earth's plants and animals need certain gases that are in the air. Plants need carbon dioxide. Humans and other animals need oxygen. If they couldn't get those gases, they would die.

Our atmosphere keeps plants and animals alive in another way too: It makes our weather. The air around Earth is always moving. It brings rain clouds to dry places. It moves rain clouds away from wet places. Why is that important to plants and animals?

_____

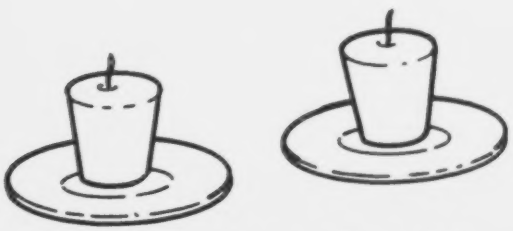
_____

Experiment 1

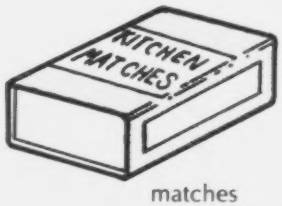
Why does a fire need oxygen?

You learned that animals use oxygen. When things burn, they also use oxygen. What happens if a burning thing can't get oxygen?

Materials (What you need)



two short candles on dishes



matches

a small glass jar

Procedure (What you do)

1. Light each candle. Wait a minute, until the flames get big.

2. Put the jar over one of the candles.

3. Watch both candles. What happens to the flames?

Observations (What you see)

1. What happens to the candle in the jar?

   _____

2. What happens to the candle that isn't in the jar?

   _____

Conclusions (What you learn)

1. The air outside of the jar had oxygen in it. So did the air inside the jar.
   a. Why did the candle inside the jar go out?

      _____

   b. Why did the other candle stay lit?

      _____

2. The candle in the jar used up oxygen as it burned. The flame went out slowly. Suppose you lifted up the jar *before* the flame went completely out. What would happen? Try it. Write what happens.

   _____

   _____

3. Things won't burn unless they have oxygen. If our atmosphere didn't have oxygen, we couldn't make fires. What would happen if we couldn't make fires?

   _____

   _____

Air Protects Earth

Have you ever been in a greenhouse? That is a kind of glass house that plants grow in. The glass traps heat from the sun. It keeps the inside of the greenhouse warm even when the weather is very cold!

Our atmosphere is something like a greenhouse. It keeps Earth warm enough for living things.

Heat energy from the sun must pass through our atmosphere before it reaches Earth. The atmosphere blocks out some of the sun's heat. That keeps Earth from getting too hot.

At night, heat leaves Earth and goes into the air. It starts to go into space. Our atmosphere keeps some heat from going into space. That keeps Earth warm.

Let's suppose we didn't have an atmosphere. What would it be like during the night? During the day?

_____

_____

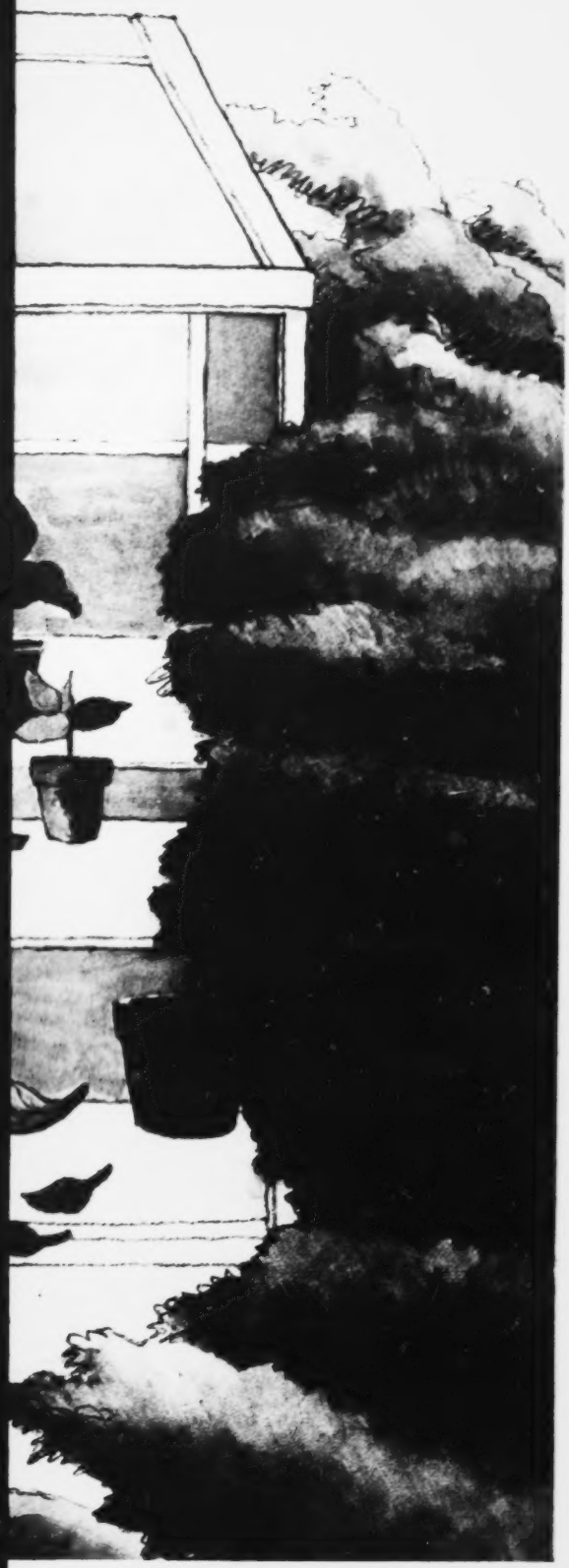
It would get freezing cold at night. It would get burning hot during the day. It would get too hot and cold for living things.

Our atmosphere protects Earth in one other important way. Objects such as *asteroids* and *meteorites* travel through space. Sometimes those objects crash into planets. They leave big holes. Earth doesn't get hit very often by those objects. That's because they usually burn up in our atmosphere. What would Earth look like if it didn't have an atmosphere?

_____

_____

_____



Dirty Air

Picture this: It's a summer day. The sun is shining. The air is warm. The sky is bright and blue.

But far away, the air looks brown. It seems dirty. What is wrong with that air?

_____

That air has **pollution** in it. Pollution makes air dirty. In many parts of our country, pollution in air is a serious problem!

Most air pollution comes from things that are burning. Burning things make smoke, and smoke goes into the air. That smoke can make an air pollution we call **smog**.

One kind of smog is made from the *particles* in smoke. The particles mix with water vapor in the air. That makes the air look brown. When we breathe that air, the particles go into our lungs.

Another kind of smog is made from certain chemicals in smoke. When sunlight shines on them, those chemicals change. They become harmful.

Smog can be bad for living things. It can hurt people's eyes and throats. It can cause some people to have breathing problems. What other problems can smog cause?

_____

_____

Usually, winds spread out smog and blow it away. But sometimes that doesn't happen. Then smog builds up over a community and becomes dangerous. What do you think people should do when that happens?

_____

_____

Earth Watch

Government *agencies* are offices that do special jobs. Some government agencies watch resources such as our air. Those agencies make sure the resources are safe to use. One such agency is the Environmental Protection Agency. (It is also known as the EPA.)

Find out where an agency like the EPA is in your community. Check the government listings of the phone book. Look for words such as *environmental protection*, *air quality*, and *pollution control*. Write the agency's name, address, and phone number.

Name: _____

Address: _____
(Number and street)

_____
(City) (State) (ZIP code)

Phone: _____

Now find out how that agency checks your air. Talk or write to someone there. Ask these questions:

- How do you check the quality of our air?
- What particles or gases can make our air dangerous?
- What is being done to keep our air clean?

Write the answers on notepaper. Put them in a notebook. Write *Earth Watch* on the notebook cover. If you get any booklets or pictures about air pollution, put those in your Earth Watch notebook too.

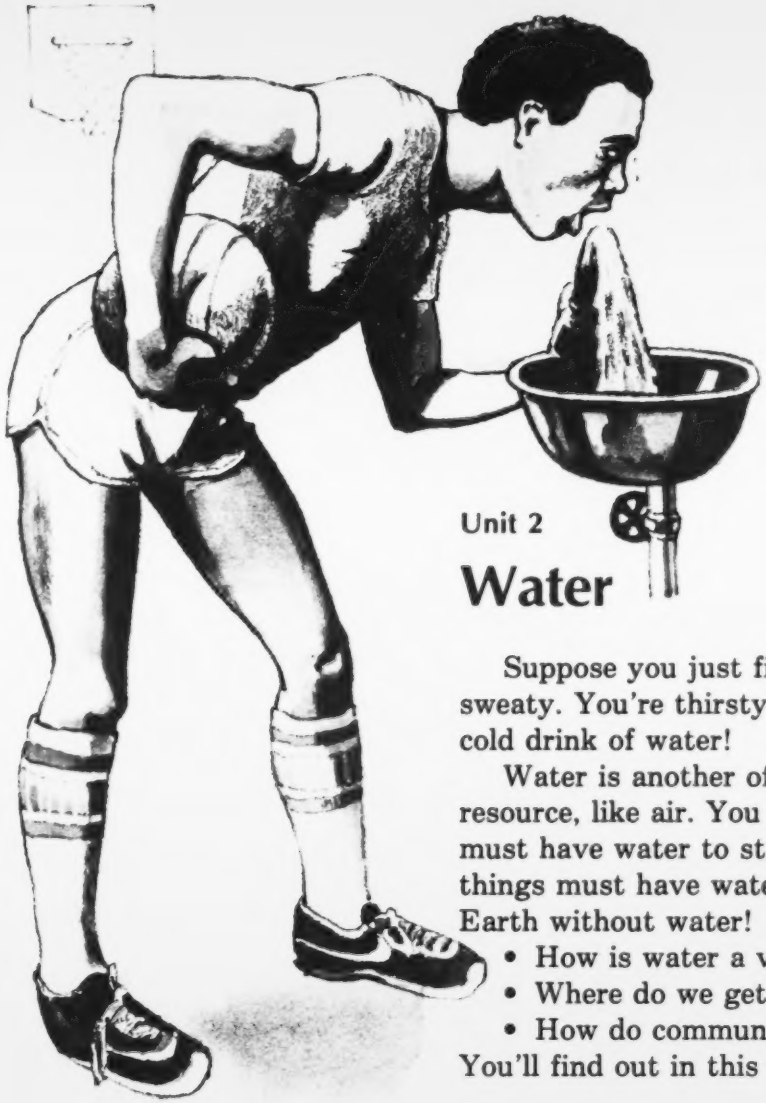
Check Yourself

1. Why is air a vital resource? Put an X in front of three right answers. One is done for you.
   - X a. It keeps Earth warm enough for living things.
   - _____ b. It gives living things the gases they need to stay alive.
   - _____ c. It makes smog.
   - _____ d. It carries water to living things.
   - _____ e. It takes care of problems in our air.
2. How can our air be harmed? (See page 9.)

   _____

Check These Out

1. Watch a weather report on TV. Find out what weather systems are moving into your community and where those systems are coming from. Then give a weather report to your class.
2. Find pictures in newspapers and magazines of things that cause smog. Cut them out and make a poster.
3. Get a book that has a big picture of Earth's atmosphere. (A librarian can help you find one.) Make a drawing of the atmosphere, and write the name of each layer.



Unit 2

Water

Suppose you just finished a game. You're hot and sweaty. You're thirsty too. You could go for a nice cold drink of water!

Water is another of Earth's resources. It is a vital resource, like air. You drink it because your body must have water to stay alive. In fact, all living things must have water. There would be no life on Earth without water!

- How is water a vital resource?
- Where do we get the water we use?
- How do communities make water safe to use?

You'll find out in this unit.

Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary. On the lines below, write what the words mean.

1. **evaporate** _____

_____

2. **ground water** _____

_____

3. **renewable resource** _____

_____

Water Everywhere

Look at a map of the world. Do you see more land or more water on the map?

Yes, you see more water. Three-fourths of Earth is covered with water.

Earth's living things need that water. We must put water into our bodies every day. We drink it. Or we get it from the foods we eat.

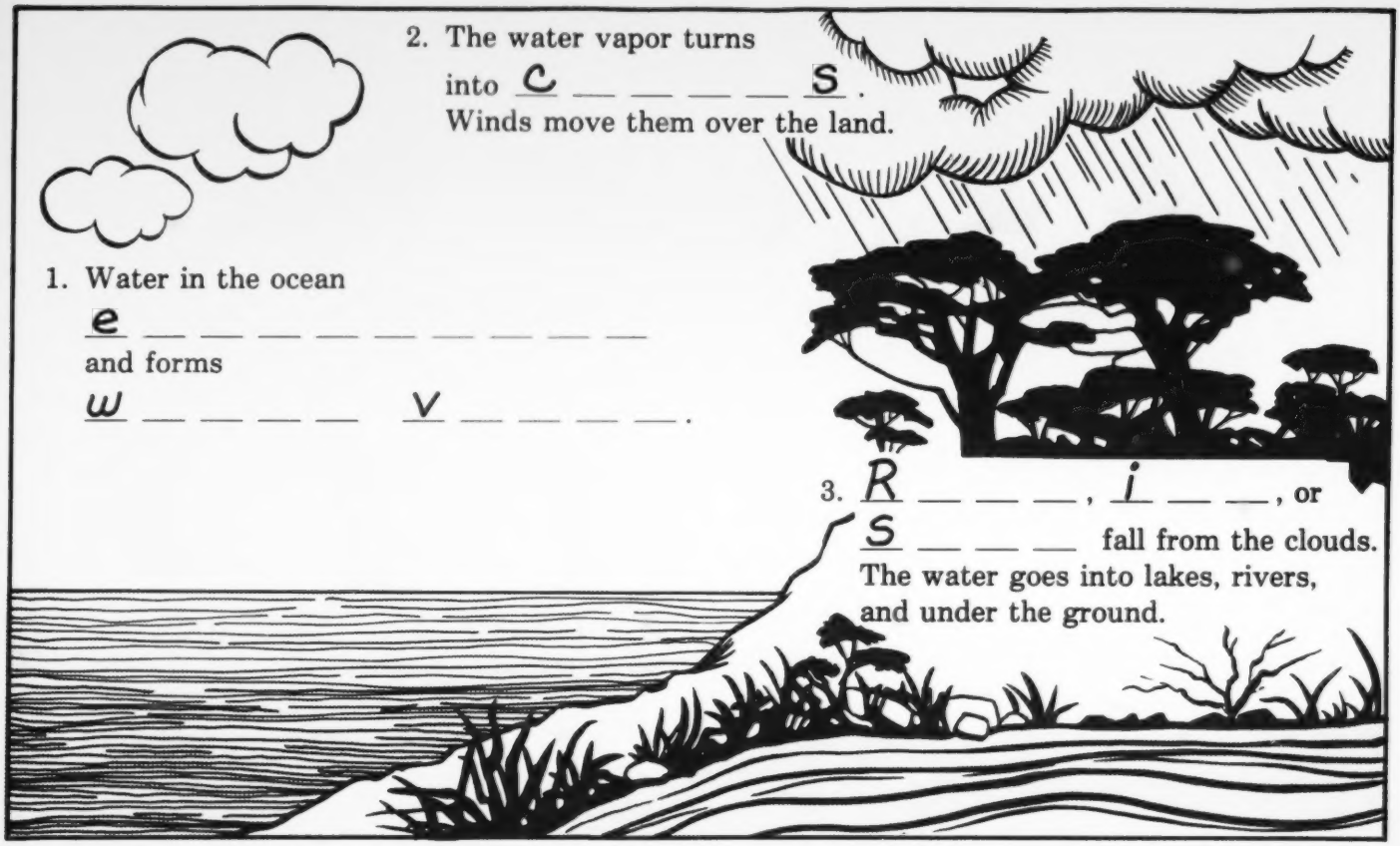
People use huge amounts of water. We use it to raise our food. We use it to cook and clean. We use it in our factories to make things such as clothes and cars. How else do we use water?

Water is a *renewable resource*. So is air. A renewable resource can be used again and again.

Even though Earth seems to have a lot of water, we can only use a small part of it. And we have problems with the water that we can use. What do you think some of those problems are?

One problem is this: Some communities can't get enough water. Their water supplies are drying up.

Another problem is this: Water can become polluted. It can become polluted by chemicals and harmful germs. Why is water pollution dangerous?


2. The water vapor turns into c _ _ _ _ _ s.
Winds move them over the land.
1. Water in the ocean e _ _ _ _ _ _ _ _ _ _
and forms
w _ _ _ _ v _ _ _ _ _.
3. R _ _ _, i _ _ _, or s _ _ _ fall from the clouds.
The water goes into lakes, rivers, and under the ground.

Oceans in Motion

Here is something to think about: Most of the water you use comes from oceans. How do you think water travels from the ocean?

It travels in the air!

Suppose you fill a cup with water. You leave that cup of water in a safe place for a week. What happens to the water in the cup?

Right! It *evaporates*. It turns into water vapor and goes into the air.

Water on Earth is always evaporating. Huge amounts evaporate from the oceans. The water vapor rises. It changes into tiny drops of water. Those tiny drops form clouds.

The clouds move. As they move, they pick up more tiny drops of water. The clouds get bigger. What moves them?

Right! Winds move the clouds.

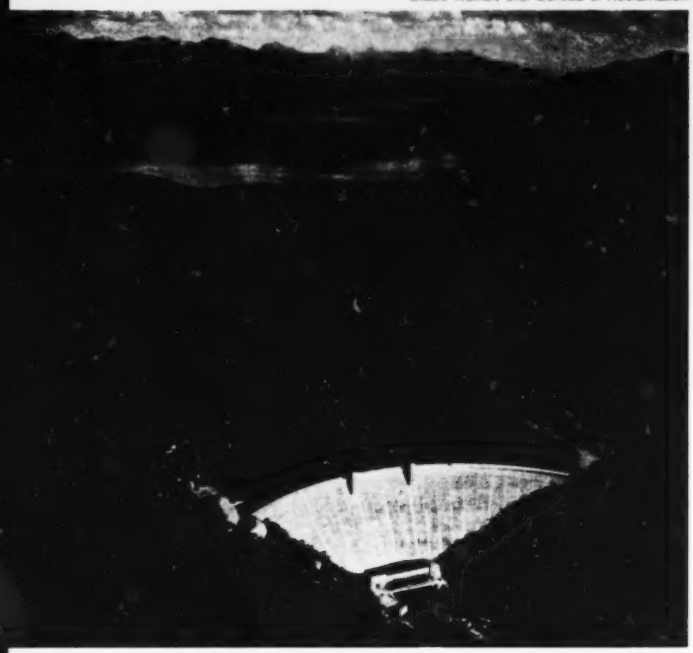
Winds blow the clouds over the land — and over your community. Rain, ice, or snow fall from the clouds. They fall to the ground.

Some of that water goes into lakes. Some goes into rivers. And some soaks into the ground. Your community pipes that water to your house from one of those places.

That's how water from an ocean gets to your house!

Now look at the diagram. Finish the sentences that tell how water moves from the ocean to the land.

Glade Walker, U.S. Bureau of Reclamation



A reservoir

The *San Jose Mercury News*

A water tank

Our Sources of Water

Every community must have a water **source**. That's the place where the community gets its water.

What do you think some water sources are?

Lakes, rivers, and *ground water* are some water sources. (Ground water is water that collects under the ground.)

Small communities often get their water from underground sources. They dig wells. The wells reach the underground water and bring the water to the top of the ground.

Large communities usually get their water from lakes and rivers. If those communities aren't near a lake or river, their water is piped in from one far away.

Communities must make sure they always have enough water. So, many of them *store* water. That means they keep extra water.

One way to store water is to **dam** it. A dam is a huge, strong wall that stops a river from flowing. Water piles up behind the dam and forms a **reservoir**. A reservoir is a kind of lake.

Communities that have wells store water differently. They use big tanks like the one shown in the picture at the bottom of the page. That water is used only when the community needs extra water. When might such a time be?

Let It Flow!

Water flows through many places before it reaches your home. The diagram on this page shows some of those places. Follow the diagram. Answer these questions about it. Then check your answers. (The correct answers are upside down.)

1. Water flows from a kind of lake that a dam formed. What is the lake called?

   _____

2. Before people can use the water it must be *treated*. So the water flows to a **treatment plant**. There, water flows through *filters*. The filters clean out leaves, dirt, and other particles. Next, chemicals such as *chlorine* are put into the water. What do you think chlorine does?

   _____

3. The treated water then goes to a **pump station**. What do the pumps next push the water through?

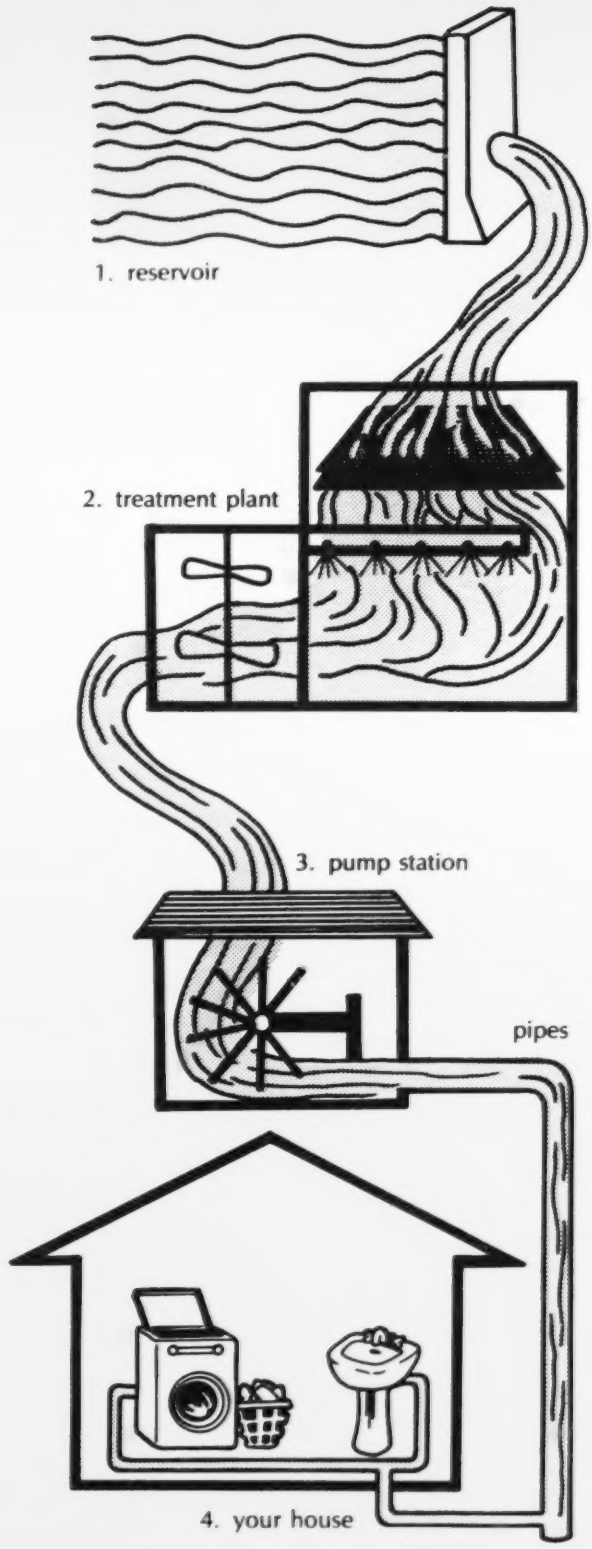
   _____

4. Big pipes carry water from the pump station to your community. Smaller pipes then carry the water into your house. Those pipes are hooked up to things that use water. What are some of those things?

   _____

   _____

   _____

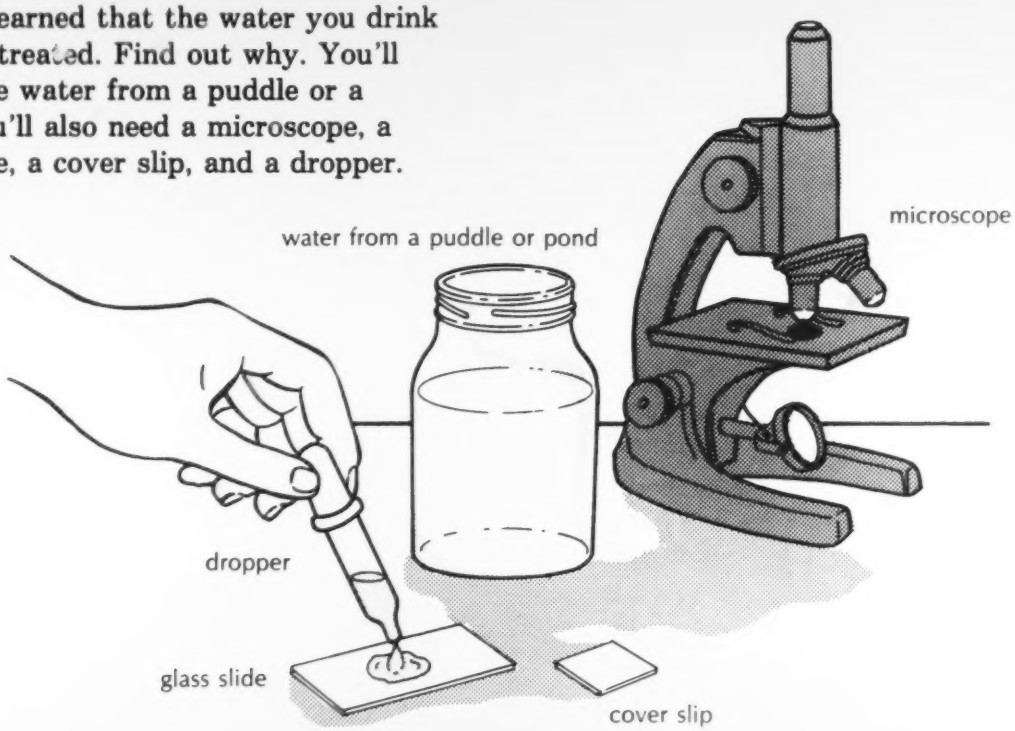


Answers

1. Reservoir 2. Kills the germs 3. Pipes
4. Sinks, showers, tubs, toilets, clothes washers, dishwashers

Why Is Water Treated?

You learned that the water you drink has been treated. Find out why. You'll need some water from a puddle or a pond. You'll also need a microscope, a glass slide, a cover slip, and a dropper.

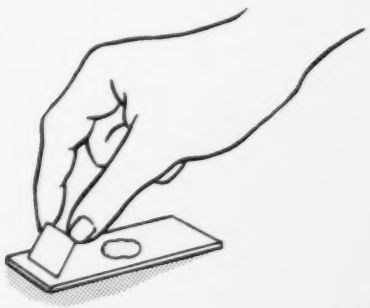


1

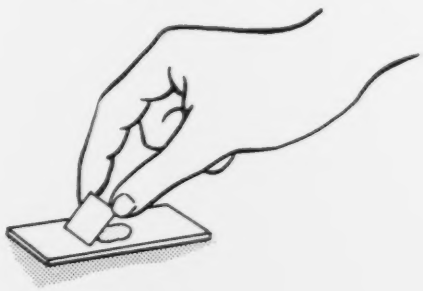
Put three drops of water on the slide.

2

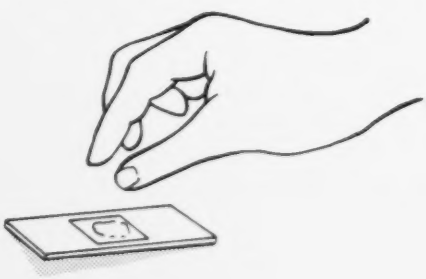
Hold the cover slip at its edges. Hold it at one end of the slide, the way the picture shows.



Slowly move the cover slip until it is over the water.

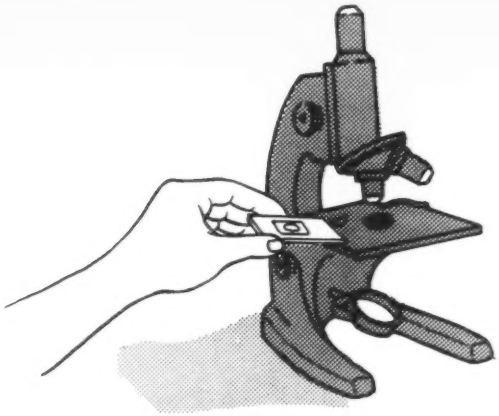


Carefully drop the cover slip.



3

Put the slide in the microscope. Turn to low power. Look into the lens and *focus* it.



4

Draw what you see.

Untreated water

What Do You Think?

1. What do you see in the water?

   _____

   _____

2. What do you think those things are?

   _____

   _____

3. Why do you think we treat water?

   _____

   _____

Earth Watch

Your community government has a *water department*. That department makes sure your community's water is safe to use.

Look up the water department in a phone book. (Look under the name of your county or city.) Write the name, address, and phone number of that department:

Name: _____

Address: _____
(Number and street)

_____
(City) (State) (ZIP code)

Phone: _____

Talk or write to someone in your water department. Ask these questions:

- How do people check the safety of our community's water?
- What causes pollution in our community's water?

Write the answers on notepaper. Put them in your Earth Watch notebook. If you get booklets or pictures, put them in your notebook too.

Check Yourself

Finish these sentences. Put an X in front of each right answer.

1. Water is a vital resource because
   _____ a. it moves around Earth.
   _____ b. it is under the ground.
   _____ c. it keeps living things alive.
2. Communities get water from sources such as
   _____ a. wells, lakes, and rivers.
   _____ b. farm land.
   _____ c. clouds.
3. Water is treated to
   _____ a. make more of it.
   _____ b. make plants grow.
   _____ c. make it clean and safe to use.

Check These Out

1. What water problems does your community have? (Examples are pollution, floods, and droughts.) Find an article in a local newspaper about a water problem. Read it and tell your class what you found out.
2. As you work through this book, you may want to find out more about Earth resources. You can find out more by looking in an encyclopedia or getting books from a library. You can also talk to an expert such as a science teacher, an environmental worker, or a government official.

   Here are some things you may want to find out:
   - What is irrigation? How is it done?
   - What is desalinization of ocean water? How is it done?
   - Why do some people use biodegradable detergents?
   - How are lakes and rivers polluted?

Unit 3

Living Off the Land

Air and water are vital resources. The land we live on is a vital resource too. It gives us all the things we need for food, shelter, and clothing.

Many of the things we use come from living things. We raise most of those living things. We raise them on large pieces of land.

- How do we use living things?
- Why is forest land important?
- Why is farm land important?

You'll learn the answers in this unit.

Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary. On the lines below, write what the words mean.

1. **nutrient** _____

_____

2. **product** _____

_____

3. **topsoil** _____

_____

U.S. Bureau of Land Management

The San Jose Mercury News

This house is being built from plant material. What do you think that material is? Where do you think it comes from?

Food, Clothing, and a Home

Your body needs air and water to stay alive. What else does your body need?

_____

Did you say *food*? If living things can't get food, they will die.

We get all our food from plants and animals. Plants give us foods such as fruits, vegetables, and grains. Animals give us meat, milk, and eggs.

We use plants and animals in other important ways, too. We use them as materials for making the things we need. We use them to make clothing, shelter, and other things that we use.

Many of the materials we use come from plants. We use all parts of the plant: stems, leaves, seeds, fruits, and flowers. Here are some things we make from plant materials: cotton clothes; paper made from trees; wood furniture; wood houses; medicines.

What other things do we make with plant materials?

_____

_____

_____

Some animal materials we use are skins, furs, and feathers. Here are some things we make: leather coats; leather shoes; feather pillows; fur coats.

What other things do we make with animal materials?

_____

_____

The Things You Use

You use many different things that are made from plants and animals. What are some of them? Look around your classroom, workplace, or home. Find food, clothes, and other products. Write those things on the chart below. Then tell what living things they came from. Write *plant* or *animal*. (Some examples are given.)

Products	Living things they came from
Foods:	
hamburger	animal
Clothes:	
leather belt	animal
Furniture:	
wood chair	plant
Other products:	
paper	plant

Forest Land

Huge areas of Earth's land are thickly covered with trees and other plants. Those areas are called **forests.** (In some parts of the world, they are called *jungles.*) Forests are an important source of wood. But forests are also important to life. Why is that?

_____

One reason is this: Forests are homes for many kinds of wild animals. Without the forests, some of those animals would become *extinct* (die out).

Forests are important in another vital way: Forests are made up of hundreds and hundreds of green plants. (Trees are one kind of green plant.) Green plants put gases that we need into our air.

One gas is oxygen. Plants take carbon dioxide from the air. They use it to make their food. The carbon dioxide is changed into oxygen. The oxygen goes out of the plant and into the air.

Why is oxygen important to us?

_____

Yes: We breathe oxygen to stay alive.

Plants also put water vapor into the air. The roots of the plants take in water from the soil. The water moves to the leaves where some of it is used. The extra water goes into the air as water vapor. That water vapor becomes clouds. The clouds turn into rain, ice, or snow.

Many forests all over the world are being cut down. People cut down trees for lumber. They clear the forests to build new towns. What do you think could happen if we cut down too many forests?

_____

_____

U.S. Bureau of Land Management

Farm Land

Where do we get the plants and animals that we use for food or materials?

_____

Right! We raise them. We raise *crops* (plants) and *livestock* (animals) on farms.

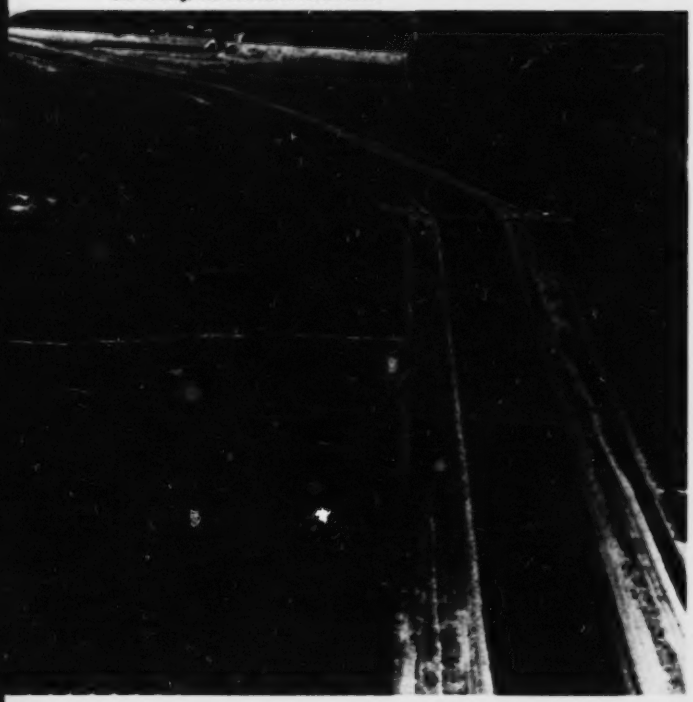
Farms are pieces of land that are used just to raise things on. If we didn't have farm lands, we wouldn't have food to feed the millions of people in our country. We wouldn't have enough materials to make things.

Farm crops can grow only on a certain kind of land. That land must be fairly flat. And it must have *topsoil.*

Topsoil is dirt that plants can easily root in. That dirt must also have the *nutrients* that plants need. And it must be able to hold a certain amount of water.

A farm can lose its topsoil. For example, the topsoil can get very dry during a **drought**. It can blow away. What do you think a drought is?

J.C. Dahlig, U.S. Bureau of Reclamation



_____

Right! A drought is a time when a place has no water for many, many months.

Suppose a farm has a lot of rain. The rain floods the land and turns it into a river. How can that be bad for the farm land?

_____

Yes: The topsoil can be washed away.

What other problems can farm lands have?

_____

_____

_____

_____

Acid Rain

You've learned that plants grow in topsoil. Topsoil has the right nutrients. When it rains, water dissolves the nutrients. Plants take in the water and the dissolved nutrients.

Some people are becoming worried about our topsoil. They say it is becoming polluted. That pollution comes because two other Earth resources are also polluted. What do you think those resources are?

_____

_____

The polluted resources are air and water. Sometimes, pollution travels through the air or water for hundreds of miles.

When we burn things such as coal, pollution goes into the air. (We burn a lot of coal in our factories.) One form of that pollution is a certain gas. When the gas mixes with water, it forms an acid.

That happens when it rains. The gas mixes with rain water and makes an acid. The acid falls down with the rain. It goes into the topsoil. We call that rain *acid rain*.

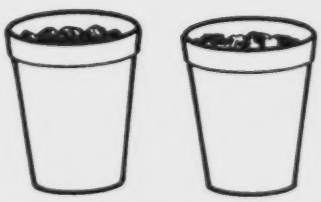
Acid rain is a serious pollution problem. It puts too much acid into the soil. That can harm plants.

What happens when there's too much acid in soil?

Experiment 2
What does too much acid do to plants?

Materials

twelve radish seeds



two Styrofoam cups filled with soil

vinegar (an acid)

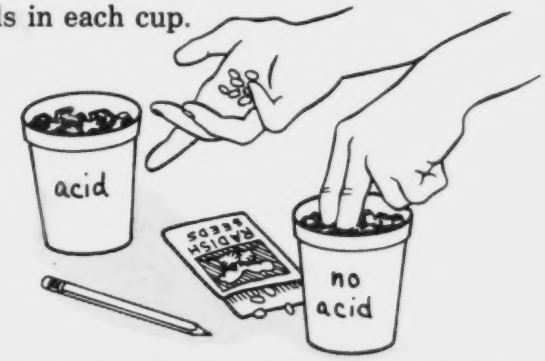
water

pencil

tablespoon

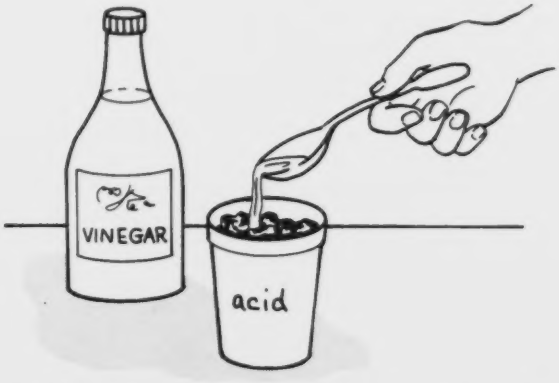
Procedure

1. Write *acid* on one cup. Write *no acid* on the other. Plant six seeds in each cup.



2. Pour a little water in both cups.

3. Pour two tablespoons of vinegar in the cup marked *acid*.



4. Put the cups in a safe place. Wait for three days. Then look at the cups.

Observations

1. After three days, what happens in the cup that got acid?

_____

2. What happens in the cup that didn't get acid?

_____

Conclusion

How does acid affect plants?

_____

_____

_____

Earth Watch

Many communities have government *agriculture* offices. Those offices watch over farming. Two such agencies are the U.S. Department of Agriculture and the State Agriculture Commission.

Look up an agriculture agency in a phone book.

Name: _____

Address: _____
(Number and street)

_____
(City) (State) (ZIP code)

Phone: _____

Write or talk to someone at that agency. Ask these questions:

- What crops grow in our community?
- Which fertilizers, pesticides, and herbicides do the farmers use?
- Where do they get water for crops?
- What is done to protect the topsoil?

Write the answers on notepaper. Put them in your Earth Watch notebook. Put booklets or pictures in your notebook too.

Check Yourself

Answer the questions below. Check your answers by looking at the page after each question.

1. How do we use plants? (page 20)

   _____

2. How do we use animals? (page 20)

   _____

3. Why are forests important? (page 22)

   _____

4. Why are farm lands important? (page 23)

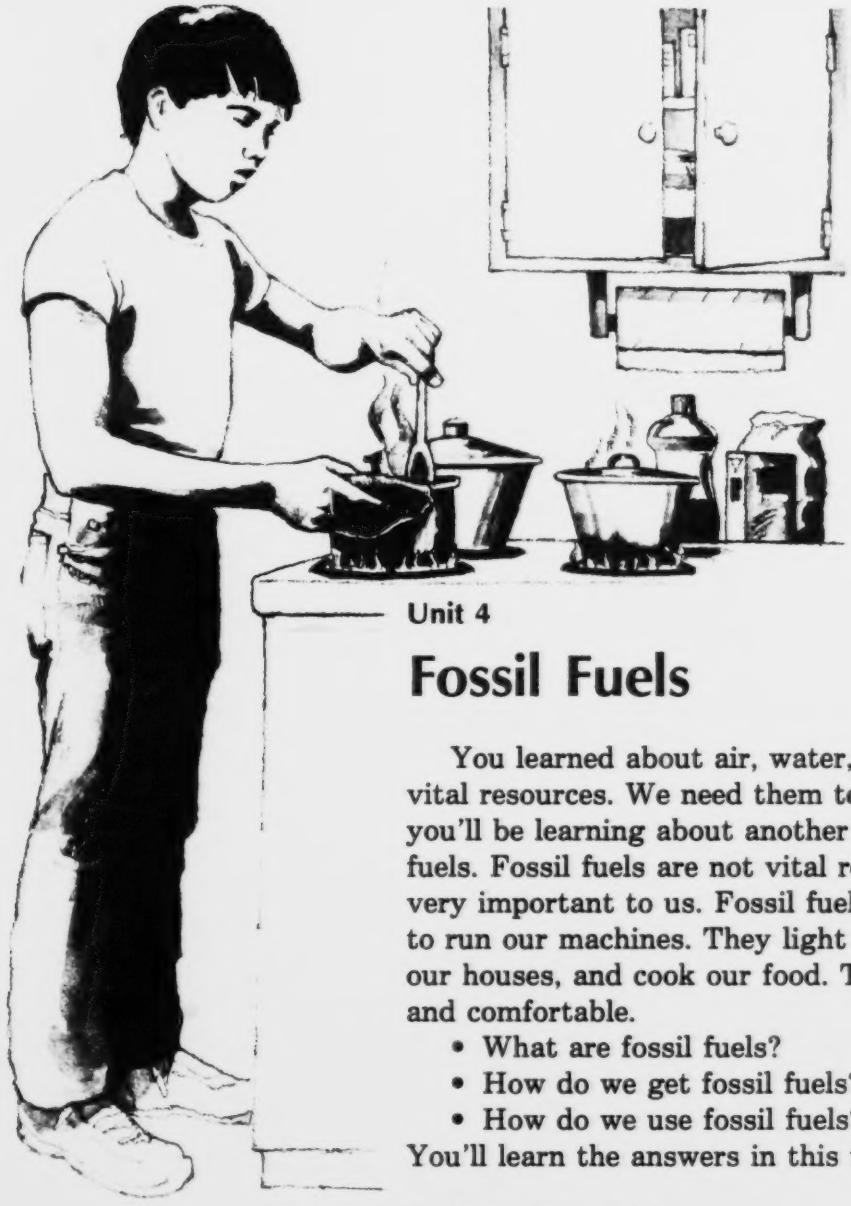
   _____

5. How is topsoil becoming polluted? (page 24)

   _____

Check These Out

1. Bring some soil to class. Plant some seeds in it. Find out if it is good for growing things.
2. Visit a park or wilderness area. Draw some plants and animals that you see. Find out their names.
3. Here are more things you may want to find out:
   - What are some ways that farmers get plants and animals to produce more food?
   - What are some problems that ecologists study?



Unit 4

Fossil Fuels

You learned about air, water, and land. Those are vital resources. We need them to stay alive. Now you'll be learning about another resource — fossil fuels. Fossil fuels are not vital resources. But they are very important to us. Fossil fuels give us the energy to run our machines. They light our buildings, heat our houses, and cook our food. They make life easier and comfortable.

- What are fossil fuels?
- How do we get fossil fuels?
- How do we use fossil fuels?

You'll learn the answers in this unit.

Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary. On the lines below, write what the words mean.

1. **conserve** _____

_____

2. **fossil** _____

_____

3. **properties** _____

_____

From this . . .

. . . to this.

Ancient Energy

Every time we turn on a light we use energy. Every time we use an appliance or run a machine we use energy. We get most of that energy by burning a fossil fuel. Coal, petroleum (oil), and natural gas are fossil fuels. Why do you think those fuels are called fossil fuels?

_____

_____

Those fuels are made from the *remains* (fossils) of plants and animals that lived millions of years ago.

Scientists think coal was formed this way: Millions of years ago, Earth was a much warmer place. It was covered by muddy *swamps*. Many large plants grew in those swamps.

As the plants died, they fell to the bottom of the swamps. Layers of dead plants built up. Then layers of soil and rock covered them. As years went by more layers of soil and rock pressed down on them. Hundreds of millions of years passed. The plant material began to change. It became coal.

Coal gives off a lot of heat when it burns. It also gives off a lot of black smoke. It burns slowly, so it burns a long time. We use it to heat buildings, run trains, and run our factories. We use it to make metals and electricity.

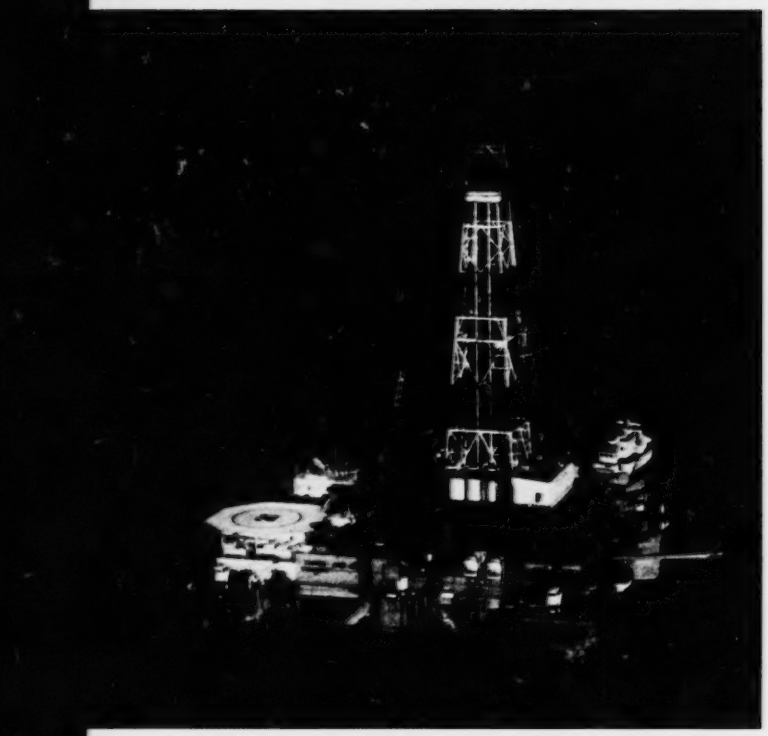
Like all fossil fuels, coal is found under the ground. It must be dug out. Mining companies dig mines to get the coal. They dig long tunnels under the ground. Or they dig up huge areas of land.

Coal is a resource that can be used up. So we say it is a **non-renewable resource**. When we take it out of the ground, no new coal forms to take its place.

What problems do you think we have with coal?

_____

_____



photos by Chevron U.S.A. Inc.

Petroleum and natural gas are found all over Earth. People dig under land and under oceans to get them.

Ocean Fossils

Petroleum and natural gas are also fossil fuels. Scientists believe they started forming about 700 million years ago. Here is how: Many tiny plants and animals lived in the oceans. When they died, their remains sank to the ocean floor. Slowly, over millions of years, they were pressed into the earth. They changed into petroleum and natural gas. And some of the oceans disappeared. They became dry ground.

Petroleum and natural gas are found deep under the ground. How do you think we get them to the surface of the earth?

_____

We get petroleum and natural gas by digging wells. A long hole is drilled through the earth. It reaches the petroleum and natural gas. Then a powerful pump forces them up to the top of the ground.

We use natural gas for cooking and heating buildings. We use petroleum for many different things. It comes out of the ground as a thick black liquid. We call that liquid *crude oil*. Petroleum is made into products, such as gasoline, kerosene, and butane. What are some other petroleum products?

_____

_____

_____

Plastic, paint, nylon, and polyester are all petroleum products. Many roads are made from a petroleum material called *asphalt*. And all cars use motor oil, another petroleum product.

Experiment 3
What are the properties of oil?

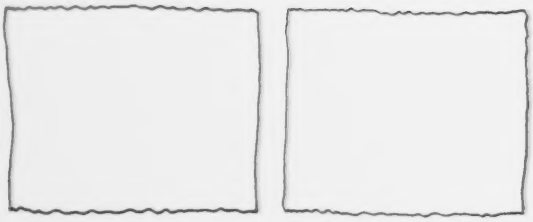
Petroleum has certain properties. Those properties make petroleum good to use in machines. Machine oil is a product of petroleum. It has some of the same properties as petroleum. What are those properties? Find out!

Materials

a small can of machine oil

water

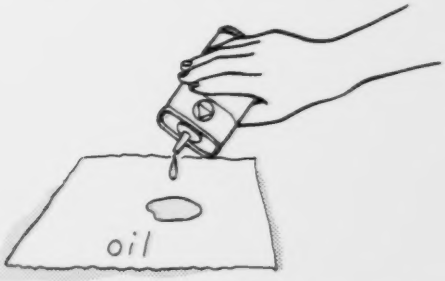
dropper


two pieces of paper towel
(both the same size)

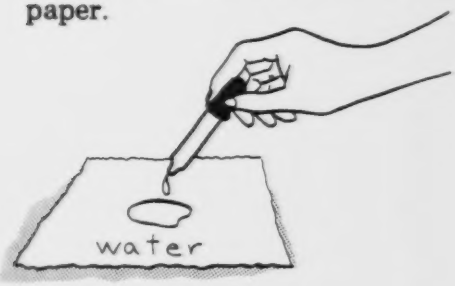
pencil

Procedure

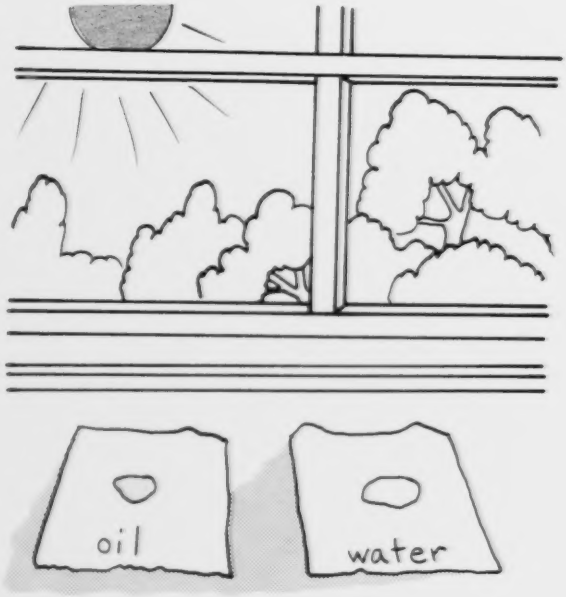
1. Write *oil* on one piece of paper. Squeeze a drop of oil on it.



Write *water* on the other piece of paper. Put a drop of water on that paper.



2. Put the two papers under a strong light or by a sunny window. Leave them to dry.



3. Now squeeze a few drops of oil on your finger. Rub your thumb and finger together. How does the oil feel?

4. Rinse your fingers in the glass of water. Does the oil come off?

Observations

1. How does the oil feel on your fingers?
   _____ a. It feels dry.
   _____ b. It feels slippery.
   _____ c. It feels hot.
2. What happens to the oil when you rinse your fingers?
   _____ a. It stays on your fingers.
   _____ b. It washes off.
   _____ c. It turns brown.
3. Look at the paper towels. Which did *not* evaporate: oil or water?

   _____

Conclusion

Machine oil has these properties: It is slippery. It takes a long time to dry out. And it doesn't wash off. So, it makes things move easier. And it stays on things for a long time. How do you think oil is used in machines?

_____

_____

_____

The Trouble with Fossil Fuels

Petroleum and natural gas are non-renewable resources. Why do you think they are non-renewable?

They are non-renewable because they take millions of years to form.

We have already used up much of the petroleum and natural gas in our wells. So oil companies must now dig deeper for those resources. They must also find new places to dig wells. Some people think that someday we'll run out of places where we can easily get those fossil fuels. What do you think will happen then?

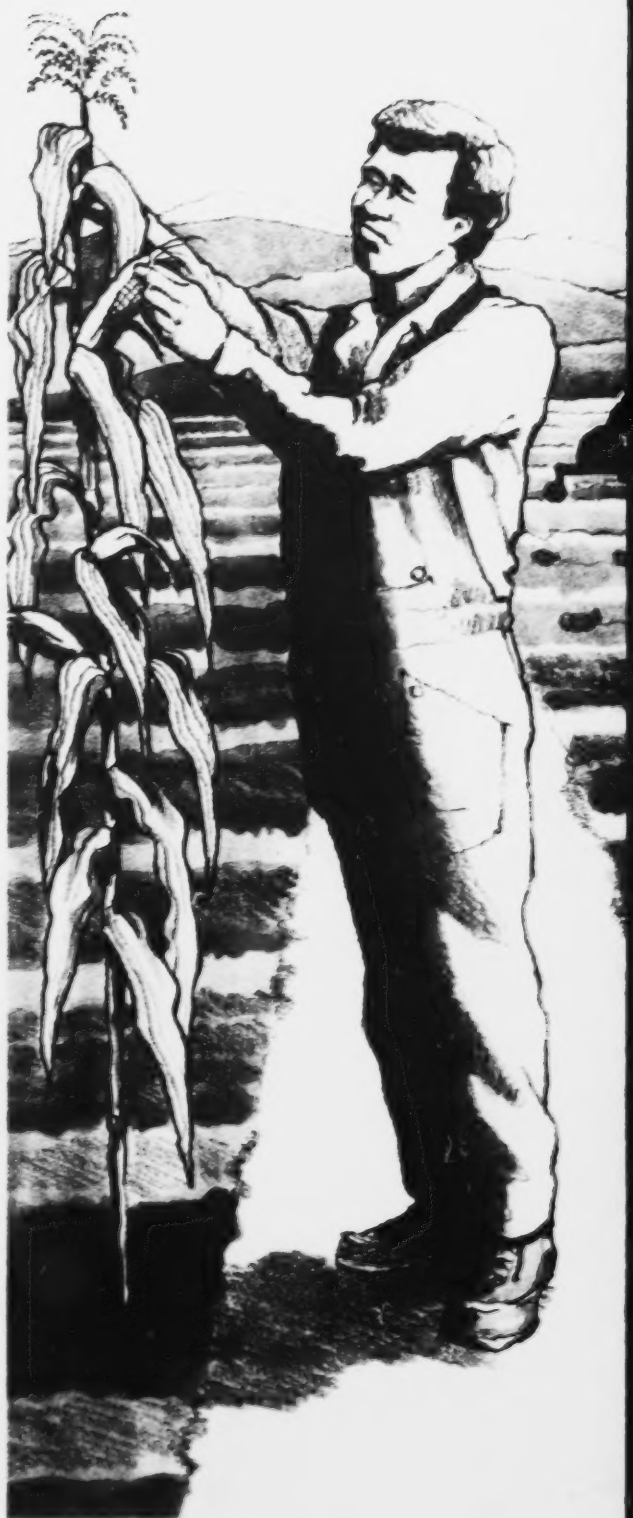
Here are some other problems: We damage other resources when we get fossil fuels out of the ground. For example, coal mining takes away topsoil and leaves big holes. Petroleum is shipped or piped. It can accidentally spill into places such as an ocean. When that happens, it kills plants and animals.

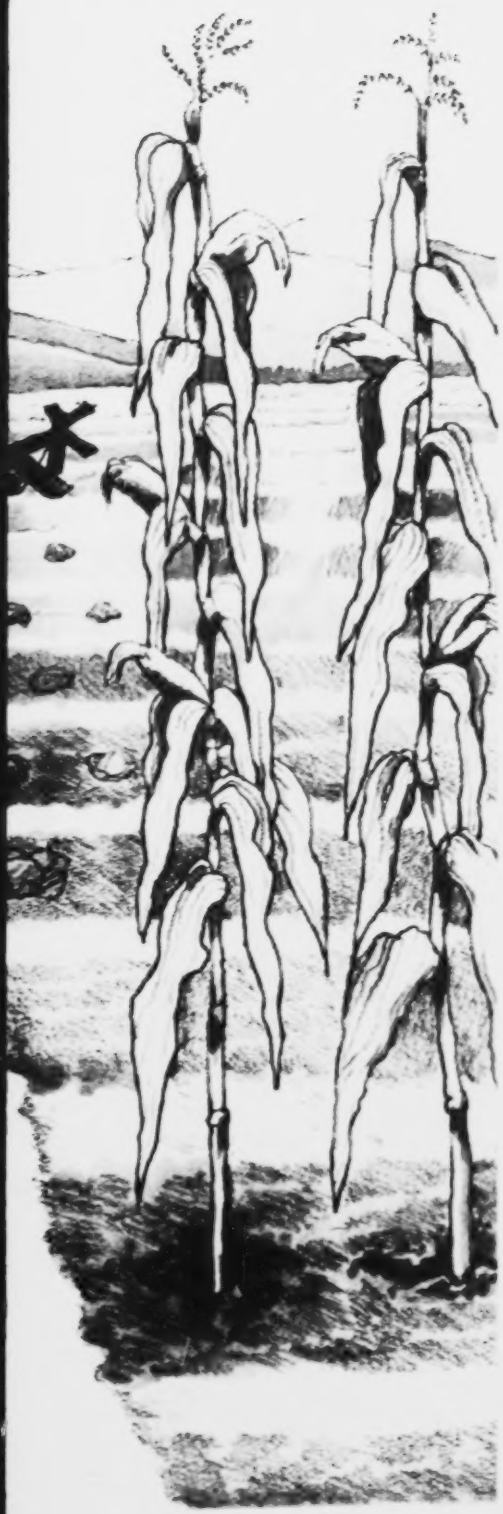
To use fossil fuels we must burn them. That causes another big problem. What is that problem?

That problem is air pollution and smog.

Smog moves with the air. It moves to our farm lands. It moves to our lakes. Chemicals from the smog get into our crops, animals, lakes, and fish.

Those farm crops, farm animals, and fish are often our food. Many of them now have dangerous chemicals in them because of pollution. What do you think we should do to make our food safer?





What Can We Do?

Polluted air is a serious problem. So, many businesses are trying to clean up our air. How do you think they are doing that?

_____

_____

_____

Here are some ways:

Most factories put special equipment on the smokestacks. That equipment traps harmful chemicals, and keeps them from going into the air.

The companies that make cars do this: They put *pollution control devices* on cars. With pollution control devices, cars make fewer harmful chemicals.

Sometime in the future, we may have another serious problem. We may run out of fossil fuel. So people are beginning to *conserve* fuel. They use less of it. People conserve fuel at home, and they conserve fuel on the road. What are some ways that you can conserve fuel?

_____

_____

_____

Did you say any of these? Turn off lights, televisions, and stereos that aren't being used. Keep the refrigerator door closed. Put on extra clothes when you are cold, instead of turning up the heat.

When you travel, you can conserve fuel these ways: Drive with other people, or take a bus. Whenever possible, ride a bicycle or walk.

Earth Watch

Communities have *utility companies*. Those companies supply fuel — heating oil, natural gas, and coal — to the homes and businesses in a community.

Find out where a utility company is in your community. Look up *gas company* or *power company* in the yellow pages of your phone book.

Name: _____

Address: _____
(Number and street)

_____
(City) (State) (ZIP code)

Phone: _____

Write or talk to someone at that company. Ask these questions:

- How is coal used in our community?
- How is natural gas used in our community?
- Which petroleum fuels are used in our community? How are they used?

Write the answers on notepaper. Put them in your Earth Watch notebook. If you get any booklets or pictures, put them in your notebook too.

Check Yourself

1. Each sentence below tells about a fossil fuel. Which fossil fuel is it? Write *coal*, *petroleum*, or *natural gas*.
   a. Gasoline, machine oil, and many other products are made from this fossil fuel.

      _____

   b. This fuel is used for cooking and heating.

      _____

   c. This fuel is burned to make steel and electricity.

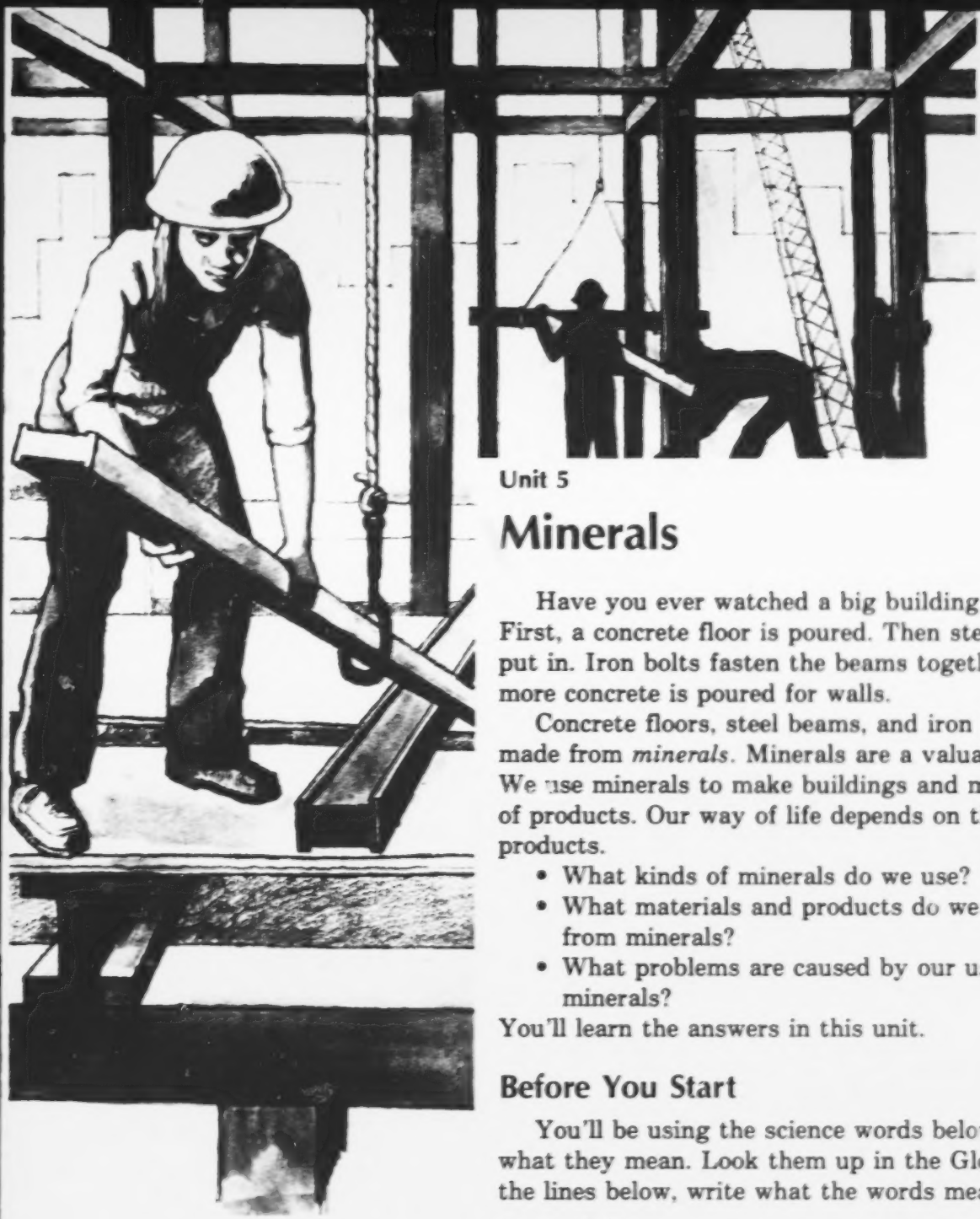
      _____

2. Why are fossil fuels called non-renewable resources?

   _____

Check These Out

1. What did the world look like during the time of dinosaurs? Draw a picture.
2. Make a list of things that use fossil fuels. How long can you make that list?
3. Here are more things you may want to find out:
   - What are petrochemicals? How are they made? What are they used for?
   - Why is coal mining a dangerous job? How do coal miners protect themselves from danger?



Unit 5

Minerals

Have you ever watched a big building go up? First, a concrete floor is poured. Then steel beams are put in. Iron bolts fasten the beams together. And more concrete is poured for walls.

Concrete floors, steel beams, and iron bolts are made from *minerals*. Minerals are a valuable resource. We use minerals to make buildings and many kinds of products. Our way of life depends on those products.

- What kinds of minerals do we use?
- What materials and products do we make from minerals?
- What problems are caused by our use of minerals?

You'll learn the answers in this unit.

Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary. On the lines below, write what the words mean.

1. **crystal** _____

_____

2. **raw materials** _____

_____

3. **recycle** _____

_____

Raw Materials

Thousands of years ago people dug a mineral from the ground. It was their raw material for making spears and knives. That mineral was *iron*. Today we still use minerals as raw materials. We use them in almost everything we make.

We say minerals are *metallic* or *non-metallic*. Metallic minerals have metals in them. They are usually heavy. Iron, silver, tin, aluminum, copper, and gold are examples of metallic minerals. We melt the metals, then form them into products. What's a product that is made of metal?

Non-metallic minerals are not as heavy as metallic minerals. Many are very light. Some look like glass. Some join together to form rocks. Quartz, salt, gypsum, and marble are examples of non-metallic minerals. So are gems such as diamonds and rubies.

We use quartz to make things such as microscope lenses. We put salt in our food. We make plaster with gypsum. And we use marble for things such as sinks, walls, and statues. How do we use diamonds?

Certain non-metallic minerals can be crushed and mixed together to form very strong materials called *cement* and *concrete*. How do we use those materials?

Minerals are a non-renewable resource. We can run out of them. All our mineral resources are found in the ground. We must mine them to get them out.

What problems do you think we have with minerals?

Crystals

Earth minerals are made of crystals. Crystals start as very tiny shapes. If more mineral material is added, crystals "grow" — get bigger.

See how the crystals of one mineral "grow." You'll need:

- salt
- dish
- 1/2 cup hot water
- spoon
- hand lens

1

Pour a little salt into the water. Stir until the salt disappears. Add more salt. Stir and add salt until it no longer disappears.

2

Let the mixture cool. Then pour some on the dish. Put it in a safe place, and wait for two days.

3

After two days, look at the dish. You should see salt crystals. Look at them with the hand lens. Draw one here.

A salt crystal

The San Jose Mercury News

Cars are made of many different metals. What do you think some of them are?

Metals in Your Life

Think of a gold ring. Think of aluminum foil. Both are products that are made of metal. When we think of a metal, we think of something that is hard, bright, and shiny. But metals don't always look like that when we dig them out of the ground. That's because they are mixed in rocks. We call those rocks **ores**.

Mining companies dig mines to get the ores. Factories next take out the metal from ores. That metal is then used to make things.

Metal is a very good material for making many different kinds of things. Why do you think that's so?

_____

Metal can be melted or pounded. It can be formed into many different shapes. And it is hard and strong. Things made from metal last a long time.

We use many different metals. One of them is copper. We make wire from copper. What else do we use copper for?

_____

Aluminum is a good metal for many products. Cooking pots are made of aluminum. What else is made of that metal?

_____

Sometimes we mix metal and other minerals together. That makes a metal material called an **alloy**. Steel is an alloy. It is stronger than any one metal alone. We use steel to make many different things. Paper clips, knives, and ships are some examples of steel products. What are some other things?

_____

_____

_____

An Iron Factory

The metal we use the most is iron. But the iron in Earth is not in a form we can use. It's mixed with other minerals in ore. How do you think we take iron out of the ore?

Right! We melt the ore in an iron factory.

Here is how we get iron: First, iron ore is dug out of a mine. It is put in a machine that crushes it into small pieces. Then it is taken to an iron factory.

The iron ore is dumped into a huge *blast furnace*. That is a special kind of furnace that gets super hot. Another mineral and a special kind of coal are also added. They help the ore to melt and the iron to separate from it.

Iron is the heaviest mineral in the melted ore. It sinks to the bottom. And it is drained out an opening in the bottom of the furnace. Most of that iron will be used to make steel. So it is sent to another furnace where steel is made.

Many Earth resources go into making iron and steel. One resource is minerals. Two other resources heat the furnace. What do you think they are?

Another resource keeps the furnace from getting too hot. It also cools the steel. What resource do you think that is?

Yes: Fossil fuels and air heat the furnace. Water cools the furnace and the steel.

The San Jose Mercury News

Inside a steel factory

The San Jose Mercury News

The steel in these wrecked cars will be recycled. It will be used again to make new steel.

Trouble Again!

We have problems with minerals! Some are like the problems we have with fossil fuels. What is one of those problems?

Every year, we want more and more mineral products. So more and more minerals are taken out of the Earth.

Taking out minerals harms Earth. It leaves giant holes. Then no one can live there. No crops can grow there either. And land around the hole can cave in, making the hole even bigger!

Another problem with minerals is this: We could run out! Many minerals are getting harder and harder to find.

Many people are trying to save our mineral resources. How do you think they're doing that?

People *recycle* mineral products. That means they use the minerals in them again. For example, old copper wires and pipes are melted. They are used to make new copper products. People also recycle steel products, such as wrecked cars. They are melted down, and the steel is used to make new cars.

You use many products that are made from minerals. You could recycle some of them. What is one product you could recycle?

Earth Watch

Most communities have a *recycling center*. That's a place where people bring throw-away products such as cans and bottles. Those products will be used to make new products.

Find out where a recycling center is in your community. Look under *recycling centers* in the yellow pages of the phone book.

Name: _____

Address: _____
(Number and street)

_____
(City) (State) (ZIP code)

Phone: _____

Talk or write to someone at that center. Ask these questions:

- What materials do you collect?
- What do you do with the materials you collect?
- What new products will be made from those materials?

Write the answers on notepaper. Put them in your Earth Watch notebook. Then start a recycling project in your classroom. Bring in materials such as cans and bottles. Take them to the recycling center. Or arrange for the center to pick them up.

Check Yourself

Answer the questions below. Check your answers by looking at the page after each question.

1. What are some metallic minerals? (page 36)

   _____

   _____

2. What are some metal products? (page 38)

   _____

   _____

3. What are some non-metallic minerals? (page 36)

   _____

   _____

4. What are some things we make with non-metallic minerals? (page 36)

   _____

   _____

5. What is one problem with minerals? (page 40)

   _____

Check These Out

1. Make a rock collection. Pick up rocks in your neighborhood or around your school. Wash them and put them in a box. Talk to an expert and find out what kinds you have.
2. Find out what factories are in your community. Check out the jobs they have.
3. Here are some things to find out:
   - How do scientists identify minerals? How are minerals tested for hardness?
   - Some companies want to mine the ocean floor. What minerals would they get?

Unit 6

Save Your Resources!

Problems!

You learned about some of Earth's vital and important resources.

What vital resources keep us alive?

_____

_____

What resources give us energy?

_____

_____

What resources give us raw materials?

_____

_____

You also learned that we have problems with our Earth resources. What problems do we have with these resources?

Air: _____

_____

_____

Water: _____

_____

_____

Forests and forest land: _____

_____

_____

Farm land: _____

_____

_____

Fossil fuels: _____

_____

_____

Minerals: _____

_____

_____

Get the Facts!

Suppose your state, city, or town has a resource problem. Maybe it's air, water, or soil pollution. Maybe fuel is too expensive and too hard to get. Or maybe land is being washed away. That problem affects you!

How would you find out all you can about that problem?

_____

_____

Here are some good ways to find out about a resource problem in your community:

1. Look at newspapers and news magazines.
   What newspapers are in your community?

   _____

   What magazines are in your community?

   _____

2. Watch local TV news programs about your community.
   What TV programs can you watch?

   _____

3. Talk to people in environmental groups. Those are people interested in saving natural resources such as wild animals, forest lands, seashores, air, water, etc.
   What environmental groups are in your community?

   _____

4. Talk to people in government agencies. (You already know of some agencies.) What agencies are close to your community?

   _____

5. Talk to people in businesses such as oil companies or power companies. What are some businesses like those in your community?

   _____

What's the Problem?

Choose one resource problem that you'd like to know more about. Then get the facts about that problem. Write about that problem here.

1. What is the problem?

2. What causes the problem?

3. What resources are harmed by the problem? How are those resources harmed?

4. How are the people in your community harmed by the problem?

Now list where you got your facts. List all the things you read and saw. List all the people you spoke with or wrote to.

Newspapers and magazines

Name	Article	Date

TV programs

Name	Channel	Date

People

Name	Title	Group or business

Take Action!

Now you know about a problem your community has. You may want to do something about it! You probably won't be able to solve the problem. But at least you can make it better.

1. What is the problem?

_____

_____

_____

_____

_____

What do you think can solve this problem?

_____

_____

_____

_____

_____

2. What can the people of your community do about the problem?

_____

_____

_____

_____

_____

3. Who can help the people of your community? (Think of businesses, government agencies, and environmental groups.)

_____

_____

_____

_____

_____

Show What You Learned

What's the Answer?

Which resource is it? Read each clue and write the name of the resource (*air, water, plants and animals, fossil fuels,* or *minerals*). There may be more than one right answer.

1. We use this resource for drinking, washing, and growing crops.

   _____

2. This resource is made of gases.

   _____

3. We make things from these resources.

   _____

   _____

4. These resources are non-renewable.

   _____

   _____

5. These resources keep us alive.

   _____

   _____

   _____

Choose one resource. Explain what problems we have using it.

_____

_____

_____

_____

What's the Word?

Write the correct word for each meaning.

1. The air that is around Earth

   A _____

2. Harmful material that gets into our resources

   P _____

3. To change from a liquid to a gas

   E _____

4. To use less of a resource

   C _____

5. A mixture of metals, such as steel

   A _____

6. What we use to make things

   R _____ M _____

7. Layer of soil that plants grow in

   T _____

Congratulations!

You've learned a lot about Earth resources. You've learned:

- what resources help keep us alive;
- what resources we make things with;
- how your community uses resources;
- how people protect and conserve our resources; and
- many other important facts about the planet you live on.

Glossary

al loy A metal that is made by mixing metals and other materials. Steel is an alloy.

at mo sphere The air that surrounds Earth.

car bon di ox ide A gas in Earth's air. Plants need carbon dioxide.

con serve To use less of a resource so it lasts longer; to use a resource wisely.

crys tal A certain shape that minerals form.

dam To hold back water with a wall.

drought A long time during which no rain falls on a place.

e vap o rate To change from a liquid to a gas.

for est A large piece of land that is covered with trees and other plants.

fos sil The remains of a plant or animal that lived long ago.

ground wa ter Water that collects under the ground.

m[illegible] al A hard shiny mineral that's used to make things.

non -re new a ble re source A resource that can be used up.

nu tri ent Something plants take in to stay healthy; a food.

ore Rock that contains minerals.

ox y gen A gas that animals need. Oxygen is one of the gases in air.

par ti cle A very tiny piece of something.

pol lu tion Harmful material that goes into air, water, and land.

prod uct Something that is made from materials.

prop er ties The ways that something looks or behaves.

raw ma te ri als Things that we use to make other things.

re cy cle To use something over again.

re new a ble re source A resource that can't be used up.

res er voir A kind of lake where people store water for later use.

smog Waste material from burning things that goes into the air.

source A large supply of something that we use, such as water.

top soil The layer of soil that plants grow in.

vi tal Necessary for life.

wa ter va por Water that's in the form of a gas.

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ISBN 0-88102-025-7